THE

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NEW ZEALAND TRADE.

IN recent issues of the ELECTRICAL REVIEW we have had occasion to refer to certain reports on the trade of our various Dominions prepared by the Trade Commissioners and published by the Board of Trade. The publication of these reports marks a new departure which should be welcomed by all who are desirous of witnessing a development of inter-Imperial trade. For many years British firms have experienced a serious lack of information regarding the trade of the Dominions overseas and of assistance in extending their trade within the Empire. Having in mind the large organisations established in these Dominions for the purpose of extending foreign trade, the absence of any British representation was all the more to be regretted. The new Imperial organisation in the interests of British trade, established some few years ago, was consequently welcomed cordially and subsequent experience has more than proved its necessity. It only remains for the organisation to become more widely known and for firms to take full advantage of it, in order to bring about an ever greater security for British trade in the Empire than has already been possible. The publication of the annual reports, to which we have referred, and the notice which has been given to them in the Press, should do much to achieve this end.

We are constrained to refer to this matter again by the fact that the Board of Trade have just published a report on the trade of New Zealand for 1912, written by Mr. W. G. Wickham, the British Trade Commissioner there, and we would now recommend our readers to obtain this new report which contains some useful hints. Extracts from the report itself are given elsewhere in this issue. In dealing with the general trade position in New Zealand, the Trade Commissioner observes that the adoption of the country of invoicing of goods as a basis for deciding the country of origin of imports results in inaccuracy and misconception; consequently, the trade statistics are not entirely reliable as a guide to the amount of foreign competition, and are particularly misleading in their statement of the share of the trade taken by the United Kingdom, since a large quantity of foreign goods shipped through the United Kingdom is classed as British. This faulty classification is a serious matter, and it is satisfactory to learn that legislation will probably be introduced at no distant date to provide for classification according to actual country of origin. In the case of goods for which there is a preferential tariff the statistics may be more safely taken as a guide, but the imports of such goods are less than one-third of the total.

The total imports into New Zealand in 1912 amounted to £20,976,434, an increase of £1,430,555 as compared with 1911, and of this amount the share of the United Kingdom, as shown in the statistics, is 58 per cent. The imports of goods in which there is a preference amounted to

£6,476,752, and the British share of this amount was 67 per cent., which proves how useful the preferential tariff has been to British trade. As in other Dominions, moreover, the British share is really more important than the actual percentage shows, since a large part of foreign trade is in goods such as natural products in which United Kingdom competition is impossible. There was a marked increase in the imports of electrical goods in 1912, viz., £71,000, and of this total increase the United Kingdom's increase was £49,000.

The Trade Commissioner points out that buyers in New Zealand show a preference for British goods; "the tariff itself provides for preferential duties on British goods on about one-third of the total of imports; preference for British goods is also shown by the Government in the purchases of State Departments and by municipal bodies and harbour boards, some of which will not buy elsewhere than in the United Kingdom; many agency firms will not, if they can help it, take agencies for other than British firms; retail as well as wholesale firms may be found who will not handle anything but British goods wherever this is possible; and among the purchasing public generally many may be found who will put themselves to considerable trouble in order to procure what they require of British make." All this is very encouraging, but there is, unfortunately, another side to the picture, and that is, that New Zealand firms are often under a misconception as to what can or cannot be produced in the United Kingdom. In our extracts from this report on another page we quote the Trade Commissioner on this subject. The obvious conclusion is that if New Zealand firms are unaware of the capability of the British manufacturer to make goods, and of the intrinsic merit of the goods themselves, the manufacturer only is to blame. It must be remembered that New Zealand is 13,000 miles away from the United Kingdom, and that facts which are known to everybody at home are therefore not necessarily known in New Zealand. American firms with their extraordinary, and not always laudable, instinct for advertising, will do their best to prevent knowledge of facts detrimental to their own business, and with a zeal which does not stop at exaggeration, will emphasise the quality of their own goods in comparison with others. If we fail to tell firms abroad that our goods are available, and are the best, and do not bring these goods directly under their notice, it is our own fault if the facts are not known.

There is another outstanding point dealt with in this report which deserves the attention of firms in the electrical trade since it refers chiefly to installation work which takes time to complete. This is the question of manufacturers' responsibility for the efficiency of deliveries. We consider this point of sufficient importance to quote here the Trade Commissioner's remarks on the subject. He says: "The British manufacturer, especially of machinery, has one great asset in the intrinsic merit of the goods he sells, and it may be presumed that manufacturers generally would not seek buyers who from ignorance or other causes failed to get good results out of their purchases. They would realise that if they did so they would lose in the end by earning, quite wrongly, a reputation for selling a bad article. To sell goods and not to be willing to take any responsibility for their quality after they have left the works, may seem sound business, but it may at times also be interpreted to mean lack of confidence in the real value of the goods delivered.

"It is a common practice to consign goods, say, a particular class of machinery, to an agent, but to draw on him in full against documents or at short sight, irrespective of the purpose to which the machinery is to be put. *I would state bluntly that any maker who values his reputation and that of his machinery will not consider any sale transaction closed until that machinery is in use and giving satisfaction.* In cases where there is delay (and these are not a few) in getting the plant installed and working, wherever the fault lies and whatever the normal terms of agency may be, the manufacturer should work loyally with his agent and take responsibility for his goods. Confidence begets confidence, and in the ideal agency the agent has a feeling of *esprit de corps* and loyalty to his principals; but he must be backed up by his firm if they expect him to back them.

"But apart from this, economy can be effected. If a manufacturer, who obviously knows his goods better than anyone else can, is not prepared to back them until they are giving satisfaction, how can the agent be expected to do so? If one or other has to allow a margin for contingencies, it is perfectly obvious that the agent, who does not know the facts as accurately as the people who made the machinery, will normally and quite rightly allow the bigger margin. If he gets the contract for which he is tendering he gains, but in a very large number of cases he will lose the contract owing to his margin of safety being excessive. Further than this, an agent relieved of responsibility for machinery which he did not make, and for delays and difficulties which are not of his seeking, will work on a finer margin to get business. It may be added that this is not pure theory, as it has been tried with good results."

Though, as our readers are aware, we do not join with those who continually bewail the shortcomings of our home firms, we are not sure that there is not on occasion too much of the take-it-or-leave-it attitude on the part of manufacturers here. If a manufacturer is not prepared to back his own goods, how can he expect others to believe in them sufficiently to give an order? To the buyer, particularly when he is so far away from the source of supply, the backing of machinery means the deferring of payment until he is sure of its capacity in actual working.

There are many other matters in this report which are deserving of comment, but we must leave them to the consideration of firms sufficiently interested to read our extracts or to obtain a copy of the report for themselves. From our own point of view we regret that the report contains no reference to the development of electrical enterprises in the Dominion, which at the moment are of considerable interest both to the Dominion itself and to our manufacturers at home.

One fact brought out in the report, however, is worthy of note in our columns, and that is, that the Trade Commissioner has been able to safeguard the British telephone instrument trade. When the duty on telephones was to be abolished it was found possible to induce the Government to retain a 10 per cent. duty on foreign instruments, while abolishing the duty on British. It is work of this practical kind which is proving the success of this organisation for the encouragement of British trade in our Dominions, and which will, we hope, eventually bring about a considerable increase in our already important share of the trade. If this is to be brought about firms here must co-operate with the Trade Commissioners, and one way in which they can do this, as this report points out, is by seeing that the Trade Commissioners are supplied with their catalogues and with information as to their present methods of business.

Copper. The last American production returns were fully up to the most sanguine anticipations which had been formed by dealers in copper, there being a considerable further decrease recorded in the surplus unsold stocks at the United States refineries, while the output also underwent a reduction during the month of August, the strike at the Lake Mines showing itself. As things stand now the position of copper is one of wholly unparalleled strength, and the future can only be viewed with genuine apprehension. Actually the world's reserves are down to the lowest on record, and the immediate outlook is for a further contraction, though this process cannot be carried far now, since there is not room for any material further contraction. According to the August American statistics, the United States refinery production amounted to 58,764 tons, a falling off of 3,000 tons or so compared with July, while the home trade takings and exports combined totalled 65,586 tons, an increase of 4,200 tons. The stocks at the United States refineries were reduced to the record low level of 17,104 tons, compared with 23,926 tons a month previously, the reduction being thus about 7,000 tons.

It was not surprising that the publication of the figures caused a good deal of selling on the market, for many people had purchased on the strength of an excellent statistical showing, and the figures proving in every way satisfactory, they naturally took their profits. On the top of this there was also a certain amount of bear selling, which came mainly from the Continent, where a poor opinion seems to be entertained of the metal. Certainly Hamburg is exceedingly bearish, and has stood at well below London parity with a heavy depreciation in far forward deliveries. It is by no means an assured thing that Hamburg is on the right side of the market, for the present indications point unmistakably towards serious scarcity soon, but the symptoms of receding trade generally are no doubt specially influencing Continental operators, and they are certainly not to be disregarded. The point, however, as regards copper, is whether or not the trade recession in sight is likely to be discounted by the falling-off in the copper production over the next few months arising from the labour troubles in the Lake Superior region and elsewhere, and the revolutionary disturbances which have entailed the closing for months of some of the most important producers and smelters in Mexico. The position in this respect has become serious across the Atlantic, so much so, that in order to supplement the material upon which the local refineries can work, the Amalgamated Copper Co. have been buying rough copper, such as Chile bars and English and French material, and taking it out of warehouses in London, Liverpool and Havre, and shipping it to New York. This material will be refined at one of the American plants of the Amalgamated Co., and in all probability the refined copper will then find its way back to Europe. The transactions clearly enough show the gravity of the position in the United States, and it is the opinion of those best informed that the next few weeks will see no relief from the present scarcity. It is specially significant that on occasions lately the cheapest sellers have been the producers, dealers not having material to offer for sale, and naming comparatively excessive figures. A very large business has been done, and one of the big electrical companies which left the filling of its October requirements rather late, had to pay a fairly stiff price, for, unable to obtain metal from producers, it was forced to take its needs from dealers, and from one of the English refiners who had a little metal over for sale. There may be fluctuations, but there really seems a very good chance of prices running up further before the position is permanently relieved.

The Aisgill Inquiry.

The evidence given at the resumed inquiry conducted by Major Pringle into the circumstances attending the recent disaster at Aisgill was in some respects of an extraordinary nature. So far as the origin of the fire was concerned, the testimony of Capt. Walter Hill appears conclusive—though previous witnesses had already practically settled the matter. Capt. Hill said that he first noticed "a big flare of light outside the carriage," which was already on fire when he got out (about two minutes after the collision occurred); the fire was *in the roof*. "Before getting out he could hear the roar of the gas flames which were coming out from underneath. They were playing on the bottom of the third compartment." "All was silent except for the roar of the gas." One of the railway officials "got underneath the train and tried to hammer down the pipe from which the gas was playing on the bottom of the carriage."

Another witness, Mr. Roland Brander, was asked: "Did you see or hear the roar of burning gas?" He replied: "Yes, several times. It was like the roar of the lights used at night time while the roads are undergoing repair."

Capt. Eustace Jotham, another passenger, said: "He saw a blaze as soon as he got out of the train. He thought it was caused by gas, because it flared up and went out again. If it had been wreckage burning it would not have gone out so quickly." Mr. T. E. Maley, a passenger, said: "The flame he saw in the roof of the carriage was certainly the flame of gas, because it was a steady and continuous light and did not flicker."

So much for the part played by gas; we cannot imagine that anyone with an open mind on the subject will retain any doubt regarding it. But the most remarkable statement was that made by Sir Guy Granet, general manager of the Midland Railway, who, after detailing the steps that had been taken to comply with the recommendations of Major Pringle in connection with the Hawes Junction accident, including the provision of an automatic valve to prevent the outrush of gas (not fitted to the coaches that were burnt), said that taking the statistics of accidents over the whole country for the last 32 years, there had been 1,602 cases, in 23 of which fire occurred. Two of these fires were attributed to oil lamps, three to electrical causes, seven to fires from locomotives, and eight to gas. This is the first time that we have ever met with the definite statement that a train fire after an accident was due to electricity—an astounding statement, for, as Major Pringle pointed out in his report three years ago, "it is a simple matter to prevent danger from short-circuiting of electric wires by the proper provision and arrangement of fuses," and with the low voltage employed on trains—far less than that used in a modern *telephone* exchange (24 volts as compared with 40) an arc cannot possibly be maintained. We unhesitatingly stigmatise the statement that electricity was the cause of fire as a ridiculous assertion, and we are certain that no Board of Trade Inspector could be persuaded to entertain it for one moment. Let Sir Guy produce a Board of Trade report in which that view is taken —if he can!

Sir Guy goes on to say that his company investigated foreign practice, and found that the consensus of opinion abroad was in favour of gas rather than electricity, and adds: "I am informed, but I have not yet verified this information, that the German and Austrian railways . . . . . have 60,000 passenger vehicles, and there is not one of them which is lighted by electricity."

This statement takes one's breath away. Has Sir Guy Granet never travelled on the Continent? If so, he must surely have been aware that a considerable proportion of the German and Austrian coaches, as well as of French, Swiss and Russian trains, are lighted with electricity, and have been for years past, and he ought to know that governing bodies have repeatedly urged the adoption of electric lighting owing to the frequency of train fires on gas-lighted trains, as mentioned elsewhere in this issue. There are two aspects in which this remark of Sir Guy Granet strikes us as particularly unfortunate, if not reprehensible: first, in that it suggests that the Midland Railway Co. look to foreign practice for guidance—surely the British railways have always claimed to lead the world!—and, secondly, in that the manager's information regarding the practice which he cites is so ludicrously and palpably erroneous. He ought never to have put forward such a statement without verification; and he could not have verified it if he had tried.

For the information of Sir Guy Granet, we may add to the list of British train fires due to gas, to which he confines himself, the following cases on the Continent, whither he professes to go for *some* of his facts:—Wannsee, 1887; Limito (Milan), 1893; Offenbach, 1900; Berlin, 1908; Vienna, June, 1908; Vienna, July, 1908; Marbourg, 1909; Herlisheim, 1909; Saint-Nazare, 1909; Innsbruch, 1909; Uhersko, 1909; Villepreux, 1910—and in the United States, Trenton, 1909.

From the evidence of Mr. Bain, carriage and wagon superintendent, it appears that *tin cans* are provided as part of the train equipment, to put out a gas fire by popping the can over the end of the broken pipe! He held that all the gas must have escaped from the cylinders within two and a half minutes after the accident; that may be so, but Capt. Hill saw the gas alight and heard the roar *before he got out*, and he was out in two minutes! He also believed that if the carriages had been of the new type with steel frames, the passengers would only have had a very bad shaking. Then, why are the Midland Co. using ancient coaches like those that were burnt—built "about 1900 or before," with wooden underframes—on their main-line expresses? The more the officials of the company say, the worse the light in which they make the company appear.

THE POWELL SACCHARINE PROCESS FOR SEASONING AND PRESERVING TIMBER.

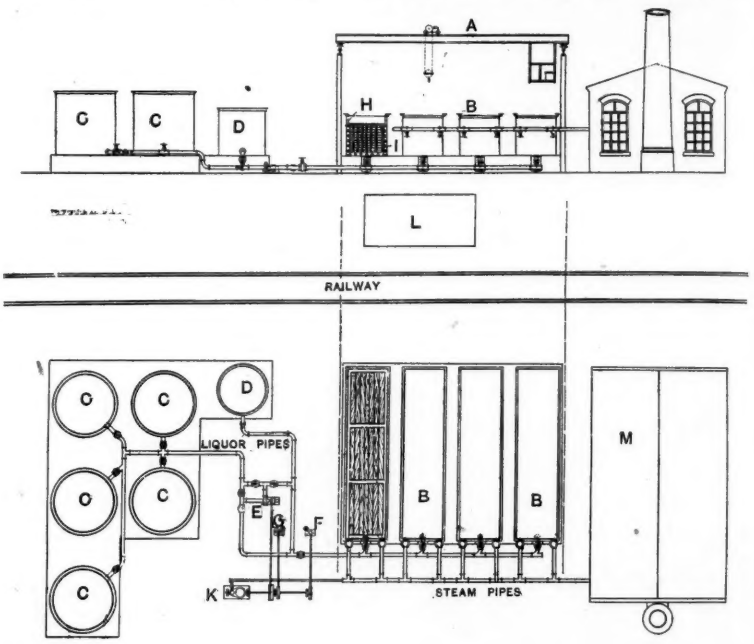
By R. E. NEALE.

It is strange that, although experiments were carried out on a commercial scale at Stratford in 1904, the Powell timber seasoning and preserving process is only now becoming widely known in this country. In Australia, New Zealand and India, large Powellising depôts have been erected, and the process has been successfully applied for years past.

The process originated in the use of saccharine materials to fill the interstices of timber and prevent ingress of the mycelium of dry rot. The preliminary experiments showed that by impregnation with a solution of sugar and its by-products, timber can be seasoned rapidly and without deterioration. Moreover, the stable hydrocarbons of the sugar are incapable, in the absence of soluble nitrogenous matter, of nourishing septic organisms, while, by the addition of arsenic solution and other poisons, insect attack can be repelled. The solution, the exact composition of which varies with the density of the timber, and the use to which it is to be applied, penetrates every cell and fissure of the timber without the application of pressure or vacuum, and the interstices are filled with a material which has a reasonable approximation to an amorphous form of timber. The seasoning and preservative action thus consists in replacing moisture and unstable juices by a substance which appears to enter into molecular combination with the timber, and then to remain absolutely inert. As compared with air drying, the process is very rapid, and fills the interstices with preservative material of appreciable mechanical strength instead of leaving them shrunken and empty.

A Powellising equipment comprises processing and storage tanks and drying kilns, a steam boiler and feed and circulating pumps, and a water reservoir if the supply be at all irregular. The general lay-out of the plant is clearly shown by the accompanying plan and key. The liquor in B, C and D is heated by steam supply from the boiler M, and the circulating pump E is used to fill or empty the processing tanks B, which are fitted with steam heating pipes; F is used to pump cold water through the coils I, in order to provide rapid and efficient temperature control in the processing tanks. The whole equipment is now arranged on one level, the use of a centrifugal circulating pump, costing £15 or so, being much more economical than arranging overhead tanks, as was formerly the practice.

The telegraph poles or other timber to be processed are stacked in the open tanks B*, suitable spacing and pinning-down cross pieces being used. Liquor at about 140° F. is then pumped in till the timber is completely submerged, and the temperature is gradually raised to about 215° F., rapid temperature control being effected as and when necessary by aid of the coils I in B. During this stage, which occupies about 15 hours, according to the size and density of the timber, all the contained air bubbles out of the timber, and the sap juices (which boil at a temperature below that to which the saccharine solution is raised) are driven off; the albuminous materials in the timber are meanwhile coagulated. During the cooling stage, which occupies about the same time as the heating, the absorption of the liquor chiefly occurs, and every interstice in the whole bulk of the timber becomes filled with poisoned saccharine matter, which is subsequently visible neither as syrup nor crystals, and which will not leach out under any exposure to weather.* Any degree of dryness (and hence a high insulation resistance) can be secured without injuring the subsequent properties of the wood, but the only materials removed from the wood are air and moisture, for which are substituted preservative matter and such materials as arsenic, required to repel insect attack. Telegraph poles and the like need not be taken from the processing tank to the drying room or kiln, but cross-arms and such smaller pieces should be so dried. When sufficiently desiccated, the wood is absolutely seasoned and ready for use. The total time occupied in seasoning and preserving green timber varies, according to the size and density of the latter, from a few days to three or four weeks.



A, Travelling crane; B, Processing tanks; C, Liquor cisterns; D, Syrup preparing cistern; E, Centrifugal pump, arranged to carry liquor from D to C, C to B, or B to C, according to needs; F, Centrifugal pump supplying cooling coils in B; G, Spare centrifugal pump; H, Holding down irons; I, Coils used for heating and cooling; K, Engine driving pumps; L, Dipping tank for treated timber; M, Boiler house. Plant shown will treat about 3,000 c. ft. of sleepers or poles per 24 hours.

Powell Saccharine Process Plant.

An installation suitable for the treatment of 80 telegraph poles (or 320 9-ft. × 10 in. × 5 in. railway sleepers) per diem comprises two 40 ft. × 4 ft. × 6 ft. 2 in. processing tanks, five circular liquor cisterns and one dissolving tank, and costs, complete with a 7 ft. × 26 ft. Lancashire boiler and the necessary piping, feed and circulating pumps and engine for the same, about £1,300 f.o.b.

The cost of treatment naturally varies with the nature of the timber and the cost of materials and labour. Under English conditions, the cost of treating telegraph poles, &c., is about 2d. per cb. ft. (the cost of the material absorbed being about 1d. per cb. ft.), to which must be added the patentees' royalty†; in the case of small parts, needing kiln drying after impregnation, the cost of treatment is from 50 to 100 per cent. greater. The cheaper grades of sugar by-products are quite good enough for telegraph poles, railway sleepers, piles, platforms, &c., and, in cases where a darker colour improves the appearance of the timber (*e.g.*, mahogany, walnut, oak, elm, &c.), the cheaper materials are distinctly advantageous even for high-class work. Where the light colour of timber is to be preserved (as in sycamore, pine and other white woods), raw sugar or glucose should

* Being run in on trucks if the tanks are some distance from the wharves or timber stacks, &c. By hand filling, some 30 per cent. more timber can be got into each tank, and the cost of treatment is correspondingly reduced.

* Experiments show that the saccharine can only be extracted by prolonged boiling of finely powdered wood. Similarly the poisonous material can only be recovered by destroying the wood with concentrated nitric acid—prolonged soaking in water removes no appreciable trace of arsenic.

† The Powell Syndicate has such faith in the future of the process that it prefers to take shares in payment for permission to Powellise timber. Rights are only sold on a royalty basis to Government and railway companies or other concerns, the chief business of which does not depend on timber preservation.

be used and the cost of special materials is somewhat increased. The cost of arsenic salts and other materials is hardly appreciable.

In Bombay, the syndicate charges 5d. per cb. ft. for treating sleepers in its own works, and the chief engineer of the West Australia Railway quotes as the average cost of treating sleepers, 3·68d. per cb. ft. plus royalty to patentees.

Typical data as to the amount of solution absorbed by various timbers are given in the following table. Naturally the absorption of each timber varies largely; for instance, there are seven or eight mahoganies, the softer ones of which absorb two or three times as much solution as the harder varieties.

ABSORPTION OF SOLUTION BY VARIOUS TIMBERS.

	Absorption.	
	Lb./cb. ft.	Per cent. of weight of timber.
Ash	5½	12½
Basswood	15	over 50
Beech	26	60
Mahogany	13	30
Pine*	3½	8-10

* The strength and toughness of this timber is greatly increased. White pine absorbs rather more solution than red or yellow pine.

Characteristics and Applications of Processed Timber.—Timber is not rendered gritty or sticky by the Powell process, and is as easy to "convert" as air-seasoned timber. Processed timber is not corrosive to the flesh or to metals; it is non-odorous, and can be painted more economically than the more absorbent air-seasoned wood. The filling material is not, like creosote, inflammable, but renders timber distinctly less flammable by filling its pores with inert material. By a modification of the standard process, most timbers can be made flame-resisting at a slightly increased cost.

Powellised timber is practically non-absorbent to moisture under ordinary conditions of weather exposure; even during prolonged submersion the wood absorbs less than 50 per cent. (20 per cent. in the case of beech), as much moisture as unprocessed timber, and the preservative and poisonous materials are not leached out appreciably. Powellised timber is used in the construction of dies for brickmaking machinery, and in other applications where it is exposed to steam, heat and moisture, without appreciable softening or warping, and without permitting corrosion of screws embedded in it. Timber processed by a solution specially prepared to resist teredos has been satisfactorily employed for piling in waters infested with these worms. White ants are a terrible pest in many countries, and mere surface protection, however perfect in itself, is insufficient, since the termites gain access through cracks or nail holes to the central, unprotected wood, and soon completely destroy the latter, while leaving practically no outward evidence of their inroads. The complete impregnation secured by the Powell process has proved the only effective means of preserving sleepers, cable troughing and telegraph poles in Australia and other white-ant countries.

Owing to the fact that they have been subjected neither to vacuum nor to pressure, the cell walls and fibres of Powellised timber retain their original strength, which is augmented by the coagulation of albuminous materials and the intimate absorption of saccharine matter; this increase in strength is particularly noticeable in the sapwood, which becomes practically equal to heartwood. A number of tests on Australian, New Zealand and American timbers show 20 per cent. to 35 per cent. decrease in weight and 30 per cent. to 50 per cent. increase in strength in hard woods; and 30 per cent. to 35 per cent. decrease in weight and 30 per cent. to 40 per cent. increase in strength in soft woods, due to Powellising.

As compared with untreated wood delivered ready for use, Powellised timber has an ultimate tensile strength greater by 6 per cent. to 26 per cent. in the case of Indian teak, 14 per cent. to 32 per cent. American pitch pine, 29 per cent. to 40 per cent. best white pine, and from 56 per cent. to over 100 per cent. in the case of yellow deal. All timbers become distinctly stronger in bending and compression when processed, and the increased bonding of the fibres is clearly evidenced by its effect on the strength of the wood.

The Powell process has proved equally successful in seasoning green timber for fine cabinet and all heavier constructional purposes, and in seasoning and preserving paving blocks, piles, troughing, sleepers and telegraph poles. In short, it is applicable to all timbers, whatever their subsequent application. By erecting processing plant near forests (an easy matter in view of the simple equipment required), timber can be completely seasoned and preserved within a few weeks from the date it is felled. This remarkable claim has been fully justified by work carried out in various countries during the past five or eight years, and it is hardly too much to say that the process is destined to revolutionise the timber trade by conserving timber supplies and making it unnecessary to hold large seasoning stocks.

In conclusion, it should be emphasised that the Powell treatment is not a new process. It has been tested and its efficacy proved under all conditions of climate, and under exposure to all fungus and insect attacks. Incontrovertible evidence is forthcoming from all quarters as to the reliability of the process, which certainly deserves to be better known and more widely employed in this country. Among the applications which have already been found for the process in electrical work may be noted the seasoning and preservation of telegraph poles and cross-arms, insulator pins, cable troughing, tanks, panels and base-boards and the woodwork in tramcars, &c.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Metalite Meeting.

My attention was drawn to your report of the Metalite shareholders' meeting, and, as a shareholder, I am perfectly disgusted with the whole matter. I had no notice of such a meeting, neither had my friends, also shareholders.

We are more than grateful to Mr. Harrison for his attention to the interests of the shareholders. If he would kindly publish his address there are many who would communicate with him, and I feel sure would support him financially in any action he may deem proper to take.

I would like to ask Mr. Harrison whether it is true that he never transferred the patents mentioned in the prospectus, because it is rumoured that he was never paid for them. I am told that they still stand in his name; if this is so, how does it come about?

Mr. Harrison was the works manager and engineer to the company. Will he give his reason for leaving the company?

In Mr. Metcalfe's evidence, before Mr. Justice Eady, and in the presence of Mr. Stewart (who is chairman of both vendor companies, also the promoting company, Electrical Trust, Ltd., and the Metalite, Ltd.), he stated, on oath, that the Bryant Trading Syndicate, Ltd., was in a profit-earning condition. Then why is it that this vendor company does not pay a dividend? also, why does it not pay the calls due on the shares of Metalite, Ltd.? Mr. Stewart did not contradict Mr. Metcalfe's statement.

The whole matter appears to me to come under a category bearing a very unpleasant name, having most serious consequences.

I am desirous of hearing of any combined action on the part of the shareholders.

A Northern Shareholder.

Continuity.

I presume that some of your remarks on the latest Birmingham Address are "writ sarcastic," for the "Advancement of Science" (the *raison d'être* of the British Association) is not helped by statements and assertions for which no evidence is offered; but scientists on a holiday are only human, and they must be allowed their little jokes!

Now, to business. You end your article with the following quotation:—

"The actions of the Deity make no appeal to any special sense . . . . we are deaf and blind, therefore, to the immanent Grandeur around us, unless we have insight enough to appreciate the Whole, and *to recognise in the woven fabric of existence*, flowing steadily from the loom in an

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infinite progress towards perfection, *the ever-growing garment of a transcendent God.*"

And I shall be happy to pay you or anybody else £5, or to give the money to the I.E.E. Benevolent Fund, if any sense can be made of the words I have underlined. They sound to me like

Tosh.

London, *September 13th*, 1913.

[Sir Oliver Lodge, whose admirable address has evoked a chorus of applause on all hands, may or may not think it worth while to take cognisance of our correspondent's inability to understand it—we have our doubts. But the former has the courage of his opinions, whereas the latter merely labels himself "Tosh"! We leave it at that.—Eds. Elec. Rev.]

The Durability of Electric Plant.

Those who have been associated with the development of the electrical industry from the earliest days will readily call to mind how the question of depreciation of electrical plant used to be a frequent subject for discussion and debate; interesting facts are now being established which indicate that some of the most sanguine expectations are likely to be fulfilled. For instance, I well remember Col. Crompton claiming that the depreciation of electric motors and dynamos might possibly prove to be 1 per cent. or less. Recalling this prophecy, I think your readers will regard the following case as of interest:—

Ten years ago I provided a factory with a complete generating plant and electric motors for driving all machinery. This plant has been running a steady 10 hours a day for these ten years, and in only one or two cases do the commutators show the slightest sign of wear, and the same applies to the bearings. The bulk of the motors run sewing-machine benches driving direct to the pulley shafting, the speed being about 400 revolutions; on the commutators of these machines not the slightest depression can be detected under the carbon brushes. Slow speed is, of course, an advantage, and it is only fair to state that the machinery has been supervised by myself throughout the 10 years, regular bi-monthly inspections being made. Employers of machinery are, as a rule, wonderfully supine as to the advantage of placing their plant under expert supervision, and often have to pay heavily through placing too much reliance upon a not too well educated staff.

The sewing-machine motors referred to have made some 75 million revolutions.

W. Poynter Adams.

Westminster, *September 11th*, 1913.

[This appears to be the installation described in our issue of July 31st, 1903.—Eds. Elec. Rev.]

Apparatus on Hire.

In view of Mr. T. C. Parsons's interesting article on the advantages of municipal motor hiring last week, perhaps it may be as well to state, on the other hand, a few of the objections to such schemes, though to the ordinary electrical trader or business man several are at once obvious.

In the first place, as things stand at present, a municipality or Corporation can usually buy motors or other apparatus at a price considerably below that at which even the largest electrical trader or contractor is able to, and if the municipal hiring or sales department is then deliberately run at a loss, as appears to be advocated, or, what amounts to the same thing, is made to show only a negligible credit balance after several years of working without any charge being made for supervision, then it is doing a very serious injury to the electrical industry.

The prices for the whole of the electrical trade, just as for any other trade, are based on the assumption that the ultimate purchaser and user of the goods shall pay a certain price which shall be somewhat above that at which a trader dealing in the goods could buy them. If a Corporation department sells or hires out motors or other apparatus on a lower basis than this, the position of the local trader or contractor is not a very enviable one, and he surely has a distinct grievance. The remedy appears to lie in the way of making Corporations, who are not out for profit, pay the ordinary customers' prices for their goods, and it would be difficult to suggest anything that would put the electrical industry more quickly on a sound basis, if it could be done. Municipal undertakings, however, though they can always borrow money and go on paying back merrily to the rates, are not all of them in a position to run even a hiring department at a loss, and it appears quite possible that future legislation will enforce the keeping of separate accounts with a correct apportionment of establishment charges in the case of all municipal trading departments, so that the full amount of these losses will have to be accounted for.

With regard to the reliability and maintenance of the motors, there would appear to be no reason why private firms should take less interest in their property than municipalities, and, generally, a company, either by its own experienced staff or through the experienced staff of the large insurance companies specialising in the work, can give better attention than a Corporation department where young assistants are generally employed, who are working for experience only and are practically unpaid.

The stock of motors, namely, eight, mentioned by Mr. Parsons, appears very inadequate and is quite insignificant compared with the number held in stock by firms specialising in the hiring out of electric motors.

The Electric Motor and Stove Hiring Co., Ltd.
H. S. Ingleby, *Secretary.*

Leeds, *September 15th*, 1913.

The City Guilds Examinations.

I have read with interest the letter by Mr. Perren Maycock, which you published on the 12th inst., and consider it worthy of serious consideration by professors and teachers who have to coach students for the examinations of the City and Guilds of London Institute.

Mr. Perren Maycock is well known as an author and lecturer on various electrical subjects, and I do not doubt that his remarks will have the effect of stirring up those who are responsible for the selection of the text-books recommended.

It is essential in all things electrical to be up-to-date, and a student who requires a useful book should know what is best suited to his studies; the C. and G. does not assist him, although it is intended to do so.

The suggestion of consulting a number of professors and teachers on the above subject might, with advantage, be extended to the subject matter of the examinations, which lack lamentably the practical modern needs of the industry.

Co-operation would produce more useful papers, and would result in employers recognising the certificates as a standard of efficiency useful to their business, a feature at present not existing. A contractor will not employ a certificated wireman because he knows the exact method of making a T, Y, or married joint, which are forbidden by the rules of the I.E.E. and similar bodies. He needs a man practised in systems, diagrams, &c., all of which should be attended to more fully in technical schools than at present.

W. Ellerd-Styles.

Leytonstone, *September 15th*, 1913.

An Echo of the Marconi Contract.

My attention has been called to your references to myself in your issues of August 1st and 15th.

I am unaware of having done or said anything to call for such discourteous personal comments.

Courtesy or discourtesy, however, is a matter of your own taste, but inaccuracy justifies me in asking you to publish a correction.

On August 1st you say of me: "But as a member of a Departmental Committee, would he not show better taste by refraining from polemics in the public Press?" The War Office Wireless Committee, of which I was chairman, was a confidential inquiry which had no relation of any kind whatever to the Marconi contract or to my visits to long-distance wireless telegraphic stations. Nobody but yourself has ever thought of attempting to make any connection between the two.

On August 15th you say of me: "For instance, Sir Henry Norman, who has seen 'every big station in Europe' (but has he seen one big Marconi station?)" . . . I have

never said that I have visited "every big station in Europe." What I did say was that I have visited, and carefully examined, every type of high-power long-distance wireless station in Europe. This I have done. The Marconi station that I visited was that at Coltano, which Mr. Marconi regards as the latest form of Marconi station of its class.

I may add that the criticisms of the two Imperial Wireless Contracts have had for effect, first, the distribution of royalty payments (*a*) among patents, and (*b*) among stations; the securing of an opportunity for competing systems to tender if they are able, within the next few months, to show successful results; and, third, the establishment in this country of a permanent national Laboratory for Radiotelegraphic Research.

I should have thought that these results would be regarded by a scientific journal like your own as a matter for congratulation, rather than for criticism.

Henry Norman.

Haslemere, *September 12th*, 1913.

[We are at a loss to understand why Sir Henry Norman regards our references to himself as discourteous. As a Member of Parliament he is surely aware that the leaders of any public movement such as that in which he has taken a very prominent part must be prepared for criticism; we certainly criticised his actions, but we deny that we treated him with discourtesy.

On July 25th we recorded the fact, on the authority of the *Times*, that "a deputation from the War Office Wireless Committee, comprising Sir Henry Norman, M.P., and Commander Silvertop, accompanied by Captain Lefroy, R.E., who is in charge of the experimental wireless work at Aldershot," had visited Vienna to inspect the Poulsen system, and that on the homeward journey the party would visit the Goldschmidt station near Hanover and the station at Laeken.

If the *Times* report was true—and we have not seen it contradicted—Sir Henry's visits to long-distance wireless stations were undertaken by him as a member of a *deputation* from the War Office Wireless Committee. How, then, can he maintain that his visits were totally unrelated to that Committee, of which he was chairman? The Postmaster-General conferred with the War Office on the subject of the Marconi contract, and we claim that our comment of August 1st was justified.

In that issue we quoted from Sir Henry Norman's own letter, published in the *Times* of July 28th, the statement that he had recently "visited, minutely examined, and taken copious notes of every type of high-power and long-distance wireless station in Europe." But on August 8th Sir Henry Norman, in the House of Commons, in the discussion on the new Marconi contract, said "he knew every big station in Europe" (*Times* report). He also said "he had seen every long-distance station in operation," (*ibid.*) in the same speech. We had that speech before us when we said in our issue of August 15th "Sir Henry Norman, who has 'seen every big station in Europe' (but has he seen one big Marconi station?)" He now tells us that he never said he had visited "every big station in Europe." Let him reconcile this with his other statements—we cannot.

The Coltano station may be the latest of its class, but it was at Clifden that the Parker Committee was shown duplex working, automatic transmission, and the Marconi continuous high-frequency generator at work on trans-Atlantic communication.

How far the results claimed for the criticisms of the two contracts are really attributable to them is a debatable question, but the points to which Sir Henry Norman particularly addressed himself, in the guise of an amateur expert—namely, the formation of a State Department to erect the wireless stations, and the abolition of the royalty—have not been conceded.—Eds. Elec. Rev.]

France.—La Société des Véhicules à Transmission Electrique Crochet is the name of a new company which has just been formed in Paris (6, Quai de Gesvres) to develop a new electrical transmission system for motor vehicles.

THE BRITISH ASSOCIATION.—I.

On Wednesday, September 10th, as already briefly noted in our issue of the 12th inst., the British Association commenced its meetings at Birmingham, with Sir Oliver Lodge's brilliant address.

Although there were notable absentees, the meeting was a thoroughly representative one; and fine weather, excellent organisation and lavish hospitality combined to make it successful.

The list of members and associates present shows that there is no falling-off in the support of the foremost workers in each branch of the huge field which the British Association cultivates. But perhaps it would be more appropriate to speak of its operations as harvesting rather than cultivation. A notable fact is the advancement of women in the field of science as exemplified at this meeting, not only in the large numbers of clever and enthusiastic camp-followers, but also in the presence of women whose work is world-famous.

Amongst the names is that of "Madame le Professeur Curie, Sorbonne, Paris"—a great woman, whose fame may well give encouragement to many of her sex who still chafe under the restrictions of an old-fashioned and deep-rooted, but decaying prejudice.

The occupation of the Presidential chair of Section K (Botany) by Miss Ethel Sargant, F.L.S., has proved not only that, for the pursuit of some branches of science, there is nothing (except the aforesaid prejudice) to check the career of a clever woman, but that she can control a mixed assemblage with dignity and success.

A prejudice is a negation of science; and it is satisfactory to note that an open mind and an open door were special features of this meeting, no less than a fine spirit of hope and progress. As usual, Sections A and B took a leading place. The study of radiations and their relation to long-established laws of physics occupied the physicists and mathematicians, and carried them far out of the depth of the non-expert.

Sir John Caird's gift of £1,000, which we noted last week, is to be devoted to the study of radio-activity; and he may yet have the privilege of seeing wonderful results from the application of his generous gift. At all events, it is safe to say that it will not, in the hands of Section A, be money wasted.

With regard to the work of the Sections, many of the old difficulties remain. The most important meetings are crowded out by a migratory body of camp-followers, who go from Section to Section to see or to hear "some new thing," and occasionally loyal adherents and supporters fail to get into the meeting of the Section to which they belong. The printing of Abstracts appears to be quite inadequate, and even in the Press room there is frequently a shortage. The speed with which printed matter disappears is extraordinary. This year the President's Address and the abstracts of papers were bound separately for each Section and sold for 6d. in the reception room. Unfortunately, the supply was not equal to the demand, and the book for Section A was unobtainable within a very short time after its appearance.

There is room for great improvement in the supply of printed matter, and the experience with these 6d. books appears to show that the cost need not be considered, as such matter can be easily sold at a price to cover the cost.

The Sections opened on Thursday, September 11th, and, as usual, Section G was deferred an hour in order to give its members an opportunity to hear Dr. Baker's address to Section A on "The Place of Pure Mathematics."

An address which made an appeal to all Sections was that of the Rev. Philip Wicksteed to Section F. As might be expected from such a versatile and original mind, it was sympathetic and humane, a fine attempt to make a deeper appeal on the part of the "Dismal Science."

It was full of good things, such as, for instance, that "A man can be neither a lover, a saint, nor a poet, unless he has recently had something to eat."

Prof. Gisbert Kapp's address to Section G called attention to the electrification of railways, and showed the great progress that is being made in this direction in Germany

and in Switzerland. We give a full abstract of it in our later pages.

Prof. Silvanus Thompson, in moving a vote of thanks, said he felt sure that Prof. Gisbert Kapp's address could not fail to produce a profound effect as soon as it had been considered by the railway engineers of this country.

It was a fine example of a moderate and reasoned discussion of conflicting views and problems. In one respect particularly nature had been kind to the electrical engineer, and that was in making the turning moment of an electric motor more uniform than that of any other motor. It was a curious and interesting point that any slight inequality in the diameters of the driving wheels of an electric locomotive corrected itself by wear on the tires in a very short time.

The first paper was a note on the proceedings of the Committee on Gaseous Explosions. The main item of information was that Prof. Dalby had obtained means to provide for a permanent research assistant, and that the new laboratories of the Imperial College of Science would be equipped with one bay specially fitted up with internal-combustion engines, Dr. Dugald Clerk co-operating with Prof. Dalby in this work.

A joint paper, by Prof. Asakawa and Prof. Petavel, on "The Effect of Compression Ratio on the Efficiency of a Gas Engine," was next taken.

Experiments had been tried on a 25-H.P. gas engine burning town gas to ascertain to what extent the theoretical laws of efficiency were attained. The general conclusion reached was that at light loads an increase of the compression ratio does not improve efficiency, owing to the influence of friction.

Prof. Burstall followed with a paper on "Solid, Liquid and Gaseous Fuels." He foreshadowed the splitting-up of coal by distillation, the oil and tar being fully utilised. He discussed the question of the gas turbine, and arrived at the usual conclusion, viz., that metal suitable for making a turbine blade which will stand the impingement of flame has not yet been found.

Dealing with fuel oil, he estimated the world's production of oil at 50 million tons a year, and coal at 1,200 million tons. It was clear, he said, that the world's oil supply was totally inadequate to replace coal. He advocated the distillation of coal on such lines as to get the highest possible yields of fuel oil and tar, instead of aiming at the maximum production of gas, sulphate of ammonia being obtained as a by-product. The theoretical yield was as high as 120 lb. of sulphate of ammonia to the ton, the practical yield being about half that figure.

A coke should be produced which would be suitable for domestic burning, the gas being used for the generation of power, either at the pit head, or by means of pipe-line distribution at any distant point where electrical energy was required.

He calculated that, in order to compete with the steam turbine for power purposes, the gas would have to be reckoned at about 4d. per 1,000 cb. ft.

Sulphuric acid could be recovered from the exhaust gases. Sulphur ash only need be bought. Propulsion of ships by internal-combustion engines was an interesting problem; but the danger of "gassing" the ship's company from the possible escape of carbon-monoxide in such a small enclosed space must not be lost sight of.

In conclusion, he pointed out that there should be no real rivalry between gas and electricity, but the first should be used to produce the second.

In opening the discussion, Mr. Mordey said he had no hope of seeing a successful gas-turbine for many years to come. He had been much interested in the Humphrey gas pump, and he believed that a high efficiency of propulsion could be obtained on board ship by using a Humphrey pump to pump in water from the bow and expel it at the stern, thus propelling the vessel by means of a water jet without mechanism.

Another member spoke of the immense loss in the deposit of sooty matter upon the surface of our large towns. In the centre of the city there was about six times as heavy a deposit as in the suburbs. It was calculated that 500 tons per sq. mile per annum was the amount of deposit in the City of London.

Prof. Hudson Beare spoke approvingly of the proposed combination of Humphrey pumps to secure a head of water, with water turbines for the generation of electricity, and was of opinion that a high overall efficiency could be obtained.

On Friday, the event of the day was the discussion in Section A upon Radiation, opened by Prof. J. H. Jeans, F.R.S.

The debate, which was largely attended, was a model of its kind. While it was clear that there were great divisions of opinion, the discussion was carried on with the utmost good nature and yet with great animation. There was no vain repetition, and though Prof. Lorentz, of Leyden, was allowed to speak several times, it was clear that the audience would not have been satisfied with anything else. The charm of his manner, and his sincerity and modesty, must have made it a pleasure to be demolished by him.

The calculations and the speculations were on a level of very high mathematics and difficult enough to follow, but to the expert and the non-expert alike it was fascinating to watch the process by which science is endeavouring to fit in the established laws and theories with the newly discovered facts.

Prof. Jeans introduced the subject to his distinguished and highly critical audience in an admirable address. Prof. Lorentz, of Leyden, Sir Oliver Lodge, Prof. Pringsheim, of Breslau, Dr. M. Bohr, Prof. Love, Lord Rayleigh, Sir Joseph Larmor, Sir J. J. Thomson, and Dr. S. D. Chalmers, all took part in the discussion, and Prof. Jeans replied.

This discussion occupied a good deal more than the time set apart for it, and not much time remained for a paper by Prof. Bragg, of Leeds, on some important work done by himself and his son on crystals examined by X-rays, an investigation throwing a good deal of light on the structure of crystals and at the same time upon the X-rays themselves.

A paper by Sir J. Larmor on "Lightning Rods" was also taken somewhat hurriedly.

A discussion on "Inland Waterways" took place in Section F.

In the evening Sir H. H. Cunynghame gave the first evening discourse, on "Explosions in Mines and the Means of Preventing them."

Saturday was entirely devoted to pleasure and sight-seeing, a large number of successful excursions being made in pleasant weather into the beautiful country, so rich in historical associations, within easy reach of Birmingham.

Main-Line Electric Traction.

By Prof. Gisbert Kapp, D.Eng.

(*Abstract of Presidential Address to the Engineering Section.*)

As regards urban and suburban lines, not only the possibility of electric traction, but its immense superiority over steam traction, is fairly generally admitted. Where we get on debatable ground is when we begin to discuss main-line traffic. We see year by year more lines being electrified. Some are failures; but the very fact that, in spite of these failures, the process of electrification is going on, shows that the failures are remediable. When we see that in all countries a vast amount of labour is devoted to, and capital is spent on, the electrification of main lines, we cannot but come to the conclusion that this new application of electricity is bound to progress.

The present tendency in electric traction is in the direction of simplicity, in the sense that mixing up of different types of current and dependence of one train on another is avoided. In France the Compagnie du Midi is electrifying on the single-phase system nearly 400 miles of track; the German Government have already electrified the Dessau-Bitterfeld section of the Leipzig-Magdeburg line, and are electrifying the line Lauban-Koenigszelt, in Silesia, to say nothing of some smaller private lines in the South of Germany, which have been in operation for some years. In Switzerland the Berne-Loetschberg-Simplon railway, already in operation, and the Rhætian Alp railway, nearing completion, also employ single-phase electromotives. Both in France and Germany the type of electromotive to be finally adopted has not yet been settled, but half a dozen different types, supplied by as many different makers, are being tried, and in this respect one may look on single-phase traction as still in the process of development. As regards the Loetschberg the period of trial is over. Three years ago the railway company ordered a 2,000-H.P. electromotive, and have had it at work ever since with such satisfactory results that they have decided to adopt this type definitely, and have ordered 13 more engines, of 2,500 H.P. on the 1½-hour rating.

The first application of the three-phase method of working took place on a small Swiss line; then followed the well-known Valtellina line, and, later still, when the Italian Government took over the railways, the Government engineers decided to extend the

application of three-phase traction to some other lines—a decision which practical experience has shown to have been perfectly justified. The total power represented by three-phase electromotives either at work or on order in Italy to-day exceeds 200,000 H.P. (95,000 H.P. in service, and 120,000 H.P. building). Ten years ago the three-phase system was the only possible one for main-line working, but later on there came on the scene the single-phase, and, later still, the high-pressure continuous-current systems, and between the advocates of the three systems there has been waged a fierce battle, each claiming that his is the best and the others very inferior. It is a futile war, for there is no such thing as a best system generally. One system is the best for one set of conditions and another for another set.

It is curious to note that the three most obvious objections which have been raised against three-phase electromotives by theorists have been found to have but little weight in practical work. These objections were: the complication of a double overhead wire, the danger that the motors would not share the load fairly, and the inability to run without rheostatic waste at intermediate speeds, or to run at a higher than synchronous speed to make up for lost time.

That an overhead wire is inconvenient must be readily admitted, but the inconvenience applies to all methods of main-line working, for the so-called third rail is not applicable to high pressure, and even if it were, the consideration of the safety of the platelayer would preclude its use. The question then is: are two wires twice as objectionable as one? Possibly, but the most objectionable feature is not the wire itself, but the posts or gantries on which it is carried, and the number of posts is the same, whether we use three-phase, single-phase, or continuous current. There is a little more complication at the cross-over points and at the switches; but this is not a serious matter, if one may judge from the perfectly smooth working of so extended a yard as that at Busalla, near Genoa, where there are five miles of track, connected by thirty-seven switches and crossings. The other objection—as to the motors not sharing the load equally—is theoretically sound. The torque developed by the motor is proportional to the slip, and in order that the two motors on an electromotive shall share the load equally their slips, and consequently also their speeds, must be the same. Now, it is conceivable that, owing to a slight difference in the size of the drivers, that motor which is geared to the larger drivers will, by reason of its lower speed and consequently greater slip, take more than its fair share of the load. In practice, however, this difficulty does not arise. With reasonably good workmanship there should be no sensible difference in the size of the wheels; but even if we admit the possibility of there being a difference of ½ per cent. in the diameter of the wheels, this would, with the usual slip of 3 per cent., only mean that the motor geared to the larger wheels develops 8 per cent. more, and the other 8 per cent. less, than its normal power. The larger wheels will develop 16 per cent. more tractive effort than the smaller wheels, and having thus a greater wear, the difference originally existing will diminish in service. For the same reason, any tendency to wear unequally, say, in consequence of unequal material, is counteracted by the slip adjustment of the motors. This point has been tested practically by the makers of the Simplon three-phase electromotives. It was found that if originally a slight difference in diameter of the drivers had been permitted to exist, after a short time this had vanished. That is as regards the conditions on one electromotive; but if we come to the case of a train being hauled by two engines, then a sensible difference in the size of their wheels may exist. In this case it is necessary artificially to adjust the slip so as to make each motor take half the load. This problem has been solved by Mr. v. Kando in the electromotives which he designed for the Italian State railways. In these engines only liquid resistances are used in the rotor circuit for starting and speed regulation. The liquid is raised or lowered in the rheostat chambers so as to cover more or less of the contact plates, and the level of the liquid is controlled by a solenoid under the influence of the working current. The working current, and, therefore, also the tractive effort exerted by each motor, is thereby automatically kept constant, notwithstanding any difference that may exist in the size of the drivers on the two electromotives. Incidentally, it may be mentioned that this method of liquid rheostat control has also the advantage of a perfectly constant acceleration during the starting period—a point which makes for comfort of travel in a three-phase train.

The third objection advanced by theorists against three-phase traction is against the waste of energy consequent on rheostatic speed control and the inability to run at more than synchronous speed so as to make up for lost time. The obvious remedy for the last-named difficulty is to fix the time-table so that the synchronous speed should be high enough for making up lost time and to employ motors which can run economically at less than synchronous speed. As a matter of practical experience, three-phase trains are not more unpunctual than any other kind, steam not excluded. A train pulled by a series motor (C.C. or A.C.) runs slower on an up-grade or if abnormally heavy; this is one of the characteristics of the series motor, and it is valuable, because it limits the excess load thrown on to the source of power; but it is clearly not a condition making for good time-keeping. With a series motor time lost cannot be recovered on an up-grade, whilst with a three-phase motor the speed on an up-grade may be kept practically the same as on the level or on down-grades, so that the process of gaining time is not restricted to the easy parts of the line.

The problem of speed control without rheostatic waste has been solved in various ways. One of the simplest and generally adopted solutions is that of cascade and single working. If the two motors are put into cascade connection the speed is halved. The cascade is used in starting and on heavy grades (unless time has to be made up), and on the easy grades or on down-grades the motors work singly—that is to say, in simple parallel connections. Intermediate speeds may be obtained by some pole-changing device. Ordinarily, such devices have to be applied to stator and rotor, but in some of the Simplon electromotives only the stator is arranged for pole-changing, the rotor being a squirrel cage. In this arrangement the advantage of cascade-working has to be given up, but the system has the merit of great simplicity. The number of poles may be changed from twelve at starting to eight, six, and four at top speed. Thus, four different speeds, all without rheostatic waste, are possible. The single bars in the squirrel-cage rotor are connected at their ends by resistance-connectors made of an alloy having a high temperature coefficient. At starting the rotor current is large and heats up these strips, thus automatically providing a starting resistance. When the motor is running the current is less, and by reason of the fanning action of the connecting strips these get cool so as to bring their resistance down to a permissible amount. Thus the efficiency of the motor when running under load is only a few per cent. less than that of a motor with a wound rotor. A valuable feature of the three-phase system is the automatic recuperation of current whenever the speed exceeds synchronous speed by a few per cent.; and connected with this property is the further advantage that it is impossible for a train to race on a down-grade. Obviously recuperation can only take place if power is given to the motor. This is provided partly by the electromotive itself, and partly by the train pushing it on a down-grade. This means that the train is braked in front only, and railway engineers have raised the objections that such a method is contrary to the accepted rules for safe working, which require that even on a down-grade all the couplings should remain in tension, which means that each coach must be independently braked. Here we have again a case where the theorists' objections have been proved to be without foundation in actual practice. It is, no doubt, objectionable to brake a train in front only, if the braking action is jerky; but with the automatically controlled liquid rheostat the braking comes in quite gradually, and is throughout so even that it has been found possible to permit a higher down-grade speed with recuperation than with ordinary braking. On the Italian State railways the regulation permits on heavy down-grades a speed of 30 km. per hour for steam trains, but the electric goods trains are permitted to run at 45 km. per hour. This concession is not extended to passenger trains. Nevertheless the economic effect is considerable. Recuperation saves 17 per cent. on the coal bill, and this amount is sufficient to provide for interest and sinking fund on the electrical plant at the generating station.

One advantage of three-phase traction over steam traction is the lessened weight of the locomotive in comparison with its tractive force and power. As an example, we may take the Giovi line in Italy, where steam trains, consisting of 310 tons of rolling stock and 202 tons of locomotive (one in front and the other at the back), have been replaced by three-phase trains, consisting of 380 tons of rolling stock and two electromotives, each weighing 60 tons (also placed front and rear). Thus there has been a saving in total weight of 12 tons, and at the same time an increase in useful weight hauled of 70 tons. The average grade of this line, over which passes the whole traffic between the Port of Genoa and the Plain of Lombardy, is 27 per mille, and the maximum is 35 per mille (3½ per cent.). This traffic is now worked with 40 electromotives, each of 60 tons weight. These engines have five driving-wheels connected to two 8-pole motors by gearwheels and rods. The pressure on each driving-axle is 12 tons. Each electromotive develops 2,000 H.P. at the hour rating; thus 1 H.P. is obtained for each 30 kilogrammes weight of engine.

The number of patented designs for single-phase traction motors is very large; but, notwithstanding considerable difference in matters of detail, all motors which have been successfully applied in practice may be ranged under three great groups—namely, the so-called repulsion type, the repulsion type with additional excitation of the rotor, and the straightforward series motor. The present tendency is rather in favour of the series motor, and the practical results obtained with it are certainly very promising. The latest design made by Dr. Behn-Eschenburg shows a remarkable weight efficiency. His 2,500-H.P. electromotives (at a one and a half-hour rating) weigh only 108 tons, so that at this rating 1 H.P. is obtained with a total weight of 43 kilogrammes. This compares favourably with the high-pressure C.C. system, where 50 to 70 kilogrammes per horse-power may be taken as normal values.

The so-called "repulsion motor" invented by Prof. Elihu Thomson has been applied to railway work in the slightly modified form due to Mr. Deri, where, instead of there being only two brushes per pair of poles, double the number is provided, and the adjustment for speed and torque is made more accurate, whilst at the same time the commutation, being split up into two steps, becomes easier. In the matter of simplicity, an electromotive fitted with Deri motors cannot be surpassed by any other arrangement. There are no rheostats, contactors, control switches, or other gear; all the regulation is effected by mechanical transmission of the movement of a hand wheel placed in the driver's cab to the brushes of the motors. At one time it was hoped that this system would win its way to a general application; but, unfortunately, the motor must run somewhere near synchronous speed, and becomes therefore rather heavy with the low frequencies alone possible in traction. Moreover, as the power-factor obtainable is only about 0·80, that is, considerably below the value obtainable with other motors, there does not seem to be any great future for this system for heavy work, although its great simplicity may still turn the balance in its favour on lines with a light traffic. For heavy lines the choice at present lies between the induction-motor with direct rotor excitation and the straightforward conduction-motor, where

rotor and stator are traversed in series by the same current. The former type of motor—also called the Latour-Winter-Eichberg motor—depends for its working current in the rotor on electro-magnetic induction, which produces the working current in the rotor much in the same way as the current in the secondary circuit of a transformer is produced by induction. Since the motor has in part the character of a transformer its weight would, as is the case with any transformer, be unduly augmented by too great a reduction in the frequency. Experience has shown that a frequency of 25 periods per second is high enough to render the transformer action effective, and at the same time not so high as to introduce serious difficulties as regards E.M.F. of self-induction and commutation. This frequency has been adopted in most cases where electrification of main lines has been carried out by motors of this class. One valuable feature of this motor is that at a speed slightly exceeding synchronism the power-factor may be brought up to unity. At this speed the commutation takes place under conditions which may be described as theoretically perfect. A fair number of Continental lines have been electrified by using these motors, and they have also been adopted, with very satisfactory results, in the electrification of the London, Brighton and South Coast lines between Victoria and London Bridge and to some distance south of London. On this line no locomotives are used, but only motor coaches. It is, therefore, not possible to make a direct comparison as to weight efficiency with a locomotive. The latter has only to carry the propelling machinery, whilst the former has to provide accommodation for passengers as well. The 600-H.P. motor coaches on the Brighton line weigh 50 tons, or at the rate of 83 kilogrammes per H.P. A 1,000-H.P. C.C. electromotive taking current at 1,200 volts weighs 74 tons. By making a suitable reduction for the extra weight of the passenger accommodation in the A.C. coach, its weight per horse-power comes out at something like 60 kilogrammes, against 62 kilogrammes in the C.C. engine.

Series motors are employed on the electrified lines of the Midland Company between Heysham, Morecambe, and Lancaster. Also in this case motor coaches, and not electromotives, are used. At the hour rating a motor coach develops 420 H.P., and as its total weight is about 35 tons, we have here the same weight efficiency as on the Brighton lines—namely, 83 kilogrammes per horse-power for the whole coach.

Of high-pressure C.C. lines there are many examples, both in Europe and America. The term high-pressure does, of course, not imply the same order of magnitude as in single-phase A.C. lines. There high-pressure may mean anything up to 15,000 volts, the pressure which is likely to become a standard in future electrifications; but in C.C. work one must class anything over 1,000 volts or 1,500 volts as high pressure. The general use is to employ motor coaches, and not electromotives; but there is a private line belonging to a steel works in Lorraine, where two electromotives, each of 600 H.P. (four C.C. motors of 150 H.P.) are working the mineral trains under a pressure of 2,000 volts, which is the highest C.C. now at work. The Southern Pacific Railway also employs C.C. electromotives of 1,000 H.P. each. Each engine weighs 74 tons, and hauls a train of 270 tons on grades of 40 per mille. This is a remarkable performance, rendered possible by the fact that with the even torque exerted by the electric motor a much larger coefficient of friction than is possible in steam traction may safely be permitted. Electrical engineers generally base their calculation of the possible tractive effort on a coefficient of 0·17, without sand, and as high as 0·25, or even 0·28 if sand is used. The voltage in the case of the Southern Pacific engines is only 1,200 volts, taken by two motors in series, and there is provision made to change over from the overhead wire to third rail, with 600 volts, when the motors are all in parallel. On European C.C. lines the voltage is higher—generally 2,000 volts, as on the Chur-Arosa and some other Swiss lines—and the tendency is still in the direction of higher pressures. Continental makers are now prepared to go as far as 1,200 volts per motor, so that with the usual system of series-parallel control a line-pressure of 2,400 volts becomes possible. The greatest step in advance in this direction has, however, been made in England, where Messrs. Dick, Kerr & Co., Ltd., have adopted a line pressure of 3,500 volts as their standard, involving the use of motors constructed for 1,750 volts. After having experimented with this high-pressure system for two years, they have undertaken the electrification of a short section of the Lancashire and Yorkshire Railway with continuous current at 3,500 volts. I am indebted to the firm for the following particulars: The current is collected by pantograph from an overhead wire with catenary suspension. The train consists of a motor coach and two trailers. The motor coach is equipped with four 300-H.P. motors, and weighs 62 tons; the trailers weigh each 26 tons. From these figures it will be seen that the weight of the motor coach per H.P. is only 52 kilogrammes, and thus considerably below what the weight of an equivalent single-phase motor coach would be. It is especially the saving in weight and the avoidance of any telephonic disturbances which renders the C.C. system so attractive that, in spite of a natural reluctance against the use of high pressure on a commutator, designers are giving increased attention to the use of continuous current for electric traction. The difficulties which some engineers anticipate with commutator and brushes seem, however, rather imaginary than real, if we may judge from the experience with the 3,500-volt motor coach. The makers inform me that they estimate the mileage for a set of carbon brushes at 50,000 miles. The motors drive the car-axles by single-reduction gear, and are controlled by contactors operated from a master controller. The current for operating the contactors, driving the air-pump motor, and for the general service of lighting and heating, is obtained from a small motor-generator, fed on the primary side at 3,500 volts, and delivering C.C. at 210 volts. All motors have commutating poles—a practice which has become universal in C.C. traction work.

From the figures quoted above it will be seen that where motor coaches are employed the C.C. system has an advantage in point of weight over the single-phase A.C. system. But main-line traction, including goods trains, is not going to be done by motor coaches, and if we come to large electromotives of some 2,000 to 3,000 H.P. then this advantage is likely to vanish. No high-pressure C.C. electromotive has as yet been built for so large a power, and it is therefore not possible to make a direct comparison; but, if we may judge from the largest engines yet built for moderate-pressure C.C., there is little probability that the C.C. system for high pressure can beat the single-phase system, and none whatever that it can beat the three-phase system.

In the early days of single-phase traction some trouble was experienced in the matter of telephonic disturbance. A systematic investigation carried on for over a year on the Seebach-Wettingen line, chiefly by means of the oscillograph, showed that this trouble was due, not as had originally been suspected, to the commutator, but to the employment of open slots in the rotor, and the trouble nearly ceased when new rotors with semi-closed and spiralled slots were used. To further improve the telephonic service the usual remedy of metallic return and drilling the telephone lines was employed. Although by these means it is possible to render telephonic speech over a line alongside a single-phase railway nearly, and perhaps quite, as clear as it is along a C.C. railway, there still remains the danger that the telephone lines may, by electrostatic induction, acquire a very high potential. The remedy against this danger, first applied on some Swedish experimental lines, is to short-circuit the two wires of each circuit by a choking coil of very high inductance, the centre of which is earthed. The static charge is thus carried off to earth, while the telephonic currents are only inappreciably weakened.

One of the advantages possessed by the alternating over the continuous current is the simplicity of regulation. There are no contactors and no rheostats used, the power and speed of the motors being adjusted by the use of tappings on the secondary side of the transformers. The only difficulty that still remains is that of sparkless commutation, but this also has been overcome. The frequency of 15 has advantages over that of 25. The Commission of Experts called together in 1904 by the Swiss Government to establish standards for the electrification of the Swiss railways decided that 15 should be the standard frequency, with

ITALIAN STATE RAILWAYS ELECTRIFIED ON THE THREE-PHASE SYSTEM.

Location of line.	In service.			In construction.		
	Lecco Colico Sondrio Chiavenna.	Campasso Ponte-derimo Rusalla.	Bassoleno Bar-donecchia Modane.	Savona S. Giu-seppe Cava.	Lecco Monza.	Genova Sampier-darena Ronco.
Length, in kilometres...	107	19	58	45	38	28
Heaviest grade per mille	22	35	30	25	12	17
No. of transforming stations	10	4	7	4	4	2
Transmission voltage...	20,000	13,000	59,000	62,000	25,000	57,000
Trolley voltage ...	3,000	3,000	3,300	3,300	3,300	3,000
Frequency (cycles per second)	15	15	16⅔	16⅔	16⅔	15
Source of power ...	Water	Steam	Water	Water	Water	Water
				Steam reserve 61 for the 3 lines		
No. of electromotives...	14	20	15			
No. of motor-coaches...	10	—	—	—	—	—
Weight of trains { minimum	150	190	—	not given		
Weight of trains { maximum	370	380	220	not given		

THREE-PHASE ELECTROMOTIVES ON THE ITALIAN STATE RAILWAYS.

Type	034	036	038	050	030
Maker	Ganz	Ganz	Ganz	Westing-house	Westing-house
Number in service ...	2	3	4	40	—
Number building... ...	—	—	—	45	16
Total weight, tons ...	45	62	62	60	66
Weight on drivers ...	45	43·5	43·5	60	48
No. of driving axles ...	4	3	3	5	3
Total No. of axles ...	4	5	5	5	5
Weight on drivers, tons ...	11·3	14·5	14·5	12	16
Diam. of drivers, mm. ...	1,396	1,600	1,600	1,070	1,630
Frequency (cycles per second)	15	15	15	15	16⅔
Method of transmitting torque of motor to driving axles	Quill and flexible coupling	Cranks and connecting rods.			
Speed, in kilometres per hour	30	32-64	22-45-63	22·5-45	37·5-50-75-100
Method of speed regulation	—	Cascade	Cascade	Cascade	Cascade and pole-changing

a tolerance down to 14, and up to 16⅔. Since then other States have fallen into line, so that 15 is now the standard frequency nearly all over the continent of Europe. The standard pressure is likely to be 15,000 volts. For three-phase traction the standard pressure is 3,000 to 3,300 volts.

On page 450 I give two tables referring to the Italian State Railways. I am indebted for the information to Mr. v. Kando, who may justly be described as the father of three-phase traction.

The most recent example of single-phase electrification is that of the Loetschberg line establishing direct communication between Berne and the Simplon line. The total weight of the electromotive is at the rate of 43 kg. at the 1½-hour rating.* This is a remarkably high weight-efficiency, which has up to the present not been reached by any continuous-current electromotive, and has only been surpassed by the three-phase 2,000-H.P. electromotives (taken at the one-hour rating) of the Italian State railways, which works out at 30 kg. per horse-power.

In conclusion, let us briefly glance at what is being done in the electrification of the Gothard line, that main link of commerce between Germany and Italy. I am indebted for the following notes on the subject to Mr. Huber-Stocker, the scientific adviser to the Swiss Government in the matter of railway electrification :— The part to be electrified first is that between Erstfeld and Bellinzona, a total length of 110 km., of which about 29 per cent. is in tunnel. This part also contains the longest and heaviest grades, so that the limitations of steam as compared with electric traction are here most prominent and a relief most urgent. On this section the average daily train movement, taking both directions together, was, in 1911, not less than 1,680,000 km.-tons, and the maximum on any day 2,282,000 km.-tons. It is estimated that in 1918 the average train movement will have increased by 35 per cent. over 1911, and in 1928 by a further 30 per cent. In the 45 km. on the north side of the tunnel the train climbs 569 metres, and in the 65 km. on the south it descends to Bellinzona 900 metres, with a steepest grade of 27 per mille. The section Erstfeld-Airolo is to be opened for electric traction in four years from now, and the southern section one year later. The present arrangements are made with the intention of extending the electric service on the north to Lucerne (60 km.), and on the south to Chiasso (55 km.) at some future date not yet fixed. There will be two large power stations, one at Amsteg, where at first 32,000 H.P. will be available on the turbine shafts, and 56,000 to 60,000 when the station is completed ; and the other at Piotta, where at first 40,000, and finally 50,000 H.P. will be available. The head of water in the northern power house is 267 metres down to the Reuss, and an accumulation of one million cubic metres is provided for, to compensate for diurnal variations. In the southern power house the head of water is 900 metres, and there the Ritom Lake offers a natural reservoir, with 19 million cubic metres, to compensate for annual variation in the water supply. The power-current will be sent along the line by two independent cables, each capable of carrying the full power at twice 30,000 volts, with earthed neutral. The current will be transformed down to 7,500 volts at first, and 15,000 volts later on, if the experience gained with the lower pressure should warrant the increase to double pressure. This will not involve any additional plant, since the secondary winding of transformers both along the line and on the locomotives can from the first be arranged with this alteration in view. It is also contemplated to establish sub-stations in Biasca, Goeschenen, Lavorgo and Bellinzona. There will be no motor coaches, only electromotives. It is intended to haul express trains weighing 420 tons with a speed of 50 km. per hour on grades of 26 per mille, for which service the electromotive will have to develop 3,000 H.P. on the rails. Goods trains weighing up to 670 tons will run with a speed of from 27 to 28 km. per hour, and have two electromotives, one in front and one in the rear, each rated at 2,800 H.P. Passenger trains will be heated by steam, the boiler being carried in a special heating coach.

The Internal-Combustion Engine Applied to Railway Locomotion.

By F. W. LANCHESTER.

THE author in his paper reviewed the various attempts that were being made to displace the steam locomotive on railways. He showed that electrification schemes on the one hand, and cars fitted with internal-combustion engines on the other, were displacing the steam locomotive under certain conditions of traffic. Mr. Lanchester then described in detail a self-propelled railway coach built by the Metropolitan Wagon Co., and equipped with internal-combustion engines, &c., by the Daimler Co. It is a 60-ft. bogie coach, with a seating capacity for 60 passengers. There are two power units on the coach, each consisting of a six-cylinder sleeve-valve Daimler engine. The cylinders are of 6-in. diameter and 6-in. stroke. The engines drive by means of a triple tandem six-speed epicyclic gear-box, in which the speeds are grouped into three low gear ratios used for starting with high acceleration, and three high gear ratios, which are exclusively used for running at speed. The whole of the gears are actuated by magnetic clutches. One axle on each bogie is driven from a cardan shaft by means of a right angle transmission. This consists of a bevel drive, in which the bevel pinion on the cardan shaft gears simultaneously into two crown wheels on the axle. Either of these wheels can be connected by means of an alternate dog clutch, and in this way the reversal of the car is effected. The two power units are disposed symmetrically on opposite sides of the vehicle and drive on to opposite ends, which gives a completely symmetrical arrangement.

The coach can be controlled from either end by means of duplicate controllers placed in the driver's cabins. The electrical equipment consists of two dynamos coupled direct to the crankshafts of the two engines, and an accumulator battery.

Electricity is used to start the engines, to light the coach, and for driving the electric air compressor, which operates the air brakes. The aggregate H.P. of the two engines is nominally 100, but on trial they have developed 110 H.P. The acceleration obtained on trial was 2·5 ft. per second per second. The consumption of petrol was found to be 170 ton-miles per gallon, as the coach ran five miles per gallon. With the H.P. provided, there was no difficulty in maintaining a speed of 60 miles per hour on a run between Nuneaton and Coventry ; and a maximum speed of 70 miles per hour had been reached. The coach with 60 passengers would be able to do the run from Euston to Birmingham at a cost of only 12s. for fuel, at the large contract rates for petrol.

PROF. H. S. HELE-SHAW opened the discussion, and pointed out that the transmission gear was a step-by-step one, which was not, for certain reasons, so good as an apparatus giving continuous speed variation. Even the electric driving of vehicles involved a step-by-step control, in which there was a considerable waste of energy except at certain positions of the controller. There were three ways of obtaining a continuous speed variation. The first was a frictional drive, which was out of the question, as it wasted energy. The second was the compressed-air system, and the third the hydraulic transmission in which he was interested. The last two systems were undergoing trials, and it would be interesting to see which would ultimately gain the confidence of railway engineers. The car with the hydraulic gear designed by him was now on trial, and he hoped to have definite results shortly. He showed a drawing of the car with pump and accessories for the continuous speed control.

After MR. LEE had raised some question as to the cost of maintenance, the AUTHOR replied, stating that whichever gearing gave most satisfaction would find a large field in self-propelled railway vehicles. The advantage of internal-combustion engines was largely one of weight, and this was so low that they had to be used on passenger vehicles rather than on the locomotives. If such engines were placed on locomotives, weight would have to be added to give the necessary adhesion for the driving wheels.

* For a description of the locomotive, see ELECTRICAL REVIEW, August 29th, 1913, page 339.

PROCEEDINGS OF INSTITUTIONS.

Electric Cooking.

By W. H. ALABASTER (Vice-President).

(*Abstract of Paper read before the* VICTORIAN INSTITUTE OF ELECTRICAL ENGINEERS, *July*, 1913.)

ALTHOUGH it is only within the last few years that the design of electrical cooking apparatus has received serious attention, so much progress has already been made that electricity will shortly become a serious competitor with coal and gas. Cleanliness, freedom from noxious gases, and a perfect control of temperature are amongst its obvious advantages, making much better culinary results attainable, while the very small amount of heat radiated during use permits the kitchen to remain as cool as any other portion of the house. Seeing that in the conversion from coal to electricity only about 7 per cent. of the heat units are retained, the necessity for obtaining a high electrical efficiency will be at once recognised.

As regards the oven we may say that the heater is of first importance, and this should be designed to carry the current continuously without any deterioration. At the present time nichrome wire is almost exclusively used for cooking appliances on account of its high specific resistance (approx. 60 times that of copper), its freedom from oxidation and its ability to withstand high temperature.

The position that the heater occupies in the oven differs according to the make of the stove, but care should be taken not to occupy unnecessary space, and to supply a fairly uniform heat throughout the oven. With a view to obtaining the latter condition, the Bertram Thomas oven is equipped with side deflectors, which create a steady circulation of hot air in the oven. To enable the cook to effect the desired browning of the cake or joint, it is an advantage to have a portion of the heater placed at the top of the oven, and this should preferably emit radiant heat, in the direction of the joint.

Loss of heat may be caused either by insufficiency of lagging between the interior of the oven and the outside case, escape of hot air through badly fitting doors, or the conduction of heat from the inside to the exterior, which often occurs at the rim of the door. The efficiency of the oven is also materially affected by the method of control, which should preferably be automatic, and it is desirable that there should be as small an amount of metal in the oven as is practicable.

Efficiency curves of several makes of ovens are shown in fig. 1, and their performances are also shown in the accompanying schedule. The early portion of these curves gives an indication of the amount of air and metal which has to be heated before the oven reaches the required temperature, and the remainder of the curves shows the thermal efficiency.

The consumption of energy required to raise the ovens to 400° F. and then to maintain them at that temperature for a further 1½ hours is shown in a separate column, and also for an approximate comparison this is stated in watt-hours per 1,000 cb. in.

Electric Ovens.—Particulars of energy consumed while raising to and maintaining internal temperature at 400° F.

No.	Make of stove.	Useful capacity in cubic inches approx.	Particulars of lagging.	Consumption in watt-hours.			Total consumption during heating up and maintaining temperature at 400° for 1½ hours.	
				½ hour.	1 hour.	1½ hours.	Watt-hours.	Watt-hours per 1,000 cb. inches.
1	Bertram Thomas	5,130	2-in. slag wool	692	1,030	1,308	1,396	272
2	Archer	4,200	Slag wool	914	1,518	2,054	2,329	554
3	General Electric Co., U.S.A.	3,672	Asbestos...	630	1,030	1,376	1,474	402
4	Tricity	3,243	None	486	860	1,178	1,218	375
5	Nightingall Auto.	3,217	Slag wool	610	910	1,165	1,240	386
6	Experimental	3,207	¾-in. slag wool	344	470	584	604	188
7	Eclipse	3,075	Slag wool	990	1,548	2,020	2,500	815
8	Nightingall Steamer	3,036	Slag wool	536	760	928	1,048	346
9	Nightingall	2,704	Straw chaff	648	969	1,256	1,342	497
10	Simplex	2,161	Slag wool	764	1,140	1,460	1,604	742
11	Nightingall Non-Auto.	2,028	Slag wool	460	788	1,112	1,177	580
12	Nightingall Non-Auto.	2,028	Slag wool	480	800	1,108	1,180	581

capacity of the respective ovens. The consumption should not, however, increase in proportion to their capacity.

The Tricity cooker, which is devoid of lagging, and is made of brightly polished sheet metal, depends on its bright surface for limiting radiation, and is very efficient when used for not more than 1½ hours at a time. This oven will meet the requirements of a small household, but for large establishments, restaurants, &c., where the oven is required to be used for longer periods, a well lagged oven, such as the Nightingall or Bertram Thomas, will prove more efficient.

Mr. Prentice has recently had made in England an oven without a door; and, with a view to investigating its efficiency (see curve 6, fig. 1), I have had a somewhat similar oven made locally (see fig. 2). It will readily be seen that this design makes for a reduction in the energy consumption and the first cost of the apparatus. Further, when the dome is raised, the escape of hot air is extremely small when compared with that which takes place on the opening of an oven door.

In the efficiency curves of ovens I have included a curve of the Nightingall steamer, which is a very useful and efficient apparatus for steaming vegetables, puddings, &c. It consists of an oven with a special heater, which raises a small quantity of water to boiling point and fills the oven with steam, the regulator automatically cutting off current when boiling point is reached.

The curves in fig. 3 give a comparision of the heat insulating values of different kinds of lagging. These show the energy consumption required to maintain various temperatures inside a tin 5 in. diameter by 7 in. high, surrounded by 1½ in. of lagging, the whole being contained in a tin with bright exterior. It will be seen that slag wool gives very good results, but, unfortunately, it has a tendency to crumble and get out of position, thus leaving unlagged spaces; and it is desirable that means be taken to keep the wool in its proper position. Further, the slag wool should not be packed very tightly, otherwise the effect of the lagging is diminished; this fault was found to cause a difference of 10 per cent. in the efficiency of an oven. Cork granules, which give the highest efficiency, and are extremely light, promise very well, and the charring which would occur at the high temperature could be overcome by placing a thin layer of, say, asbestos sheeting next to the interior of the oven.

For the purpose of obtaining the curves of the ovens a Nightingall regulator was used for maintaining the temperature at 400° F., but it would not be possible for the majority of ovens to obtain such results under ordinary working conditions, as the Nightingall automatic stove is the only one so equipped. This regulator consists of a thermometer which closes a relay circuit operating a switch in the heater circuit, in such a manner that the temperature is maintained within a very few degrees of the heat selected by the switch. This regulator works in a most satisfactory manner, not only effecting considerable saving in energy, but also ensuring uniformity of temperature. The personal factor, which in ordinary cooking is so important, becomes almost negligible, and people with little or no skill obtain uniformly good results. Curves Nos. 11 and 12 in fig. 1 were taken at different times from the same oven, and will show how closely this regulator works.

Non-automatic stoves are generally supplied with two switches—one for raising the oven quickly to the required temperature, and the other for maintaining the oven at the cooking temperature. The amount of current required for the latter heat can be very closely estimated, so that the oven can be kept at a practically constant temperature.

The hot plates are next to be considered, and these, owing to their constant use, are scarcely less important than the oven. The hot plate itself should have a smooth and even surface of sufficient area to allow the kettle or other vessel to conduct away the heat as fast as it is generated. The question of suitable insulation between the wire and the plate is of considerable importance, as, although mica is a high electrical insulator, and also a very fair conductor of heat, it unfortunately changes its physical condition when raised to a very high temperature.

The curves in fig. 4 give the overall efficiency obtained by using various types of hot plates to raise three pints of water to boiling point. These are based upon the theoretical figure of 55 watt-hours being required to raise one pint 150° F. As these curves include the heat of the kettle and the radiation from it, they cannot be taken as absolute figures of efficiency of the hot plate, but are intended as a comparison of the efficiencies of various types when performing similar work.

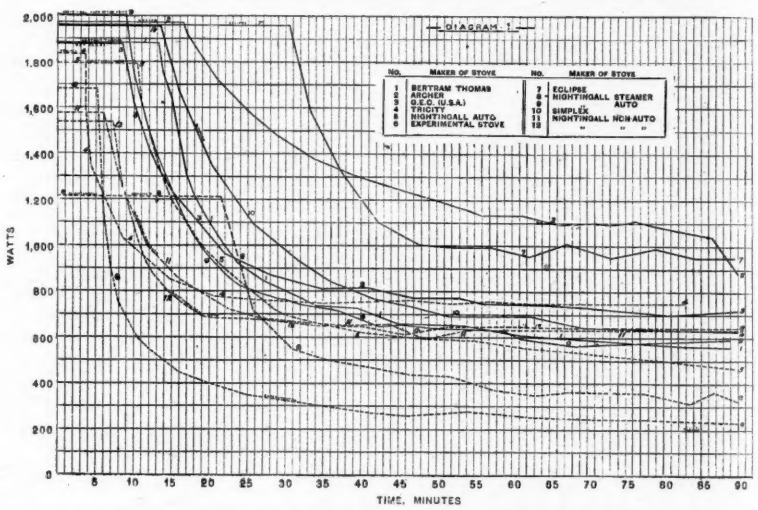
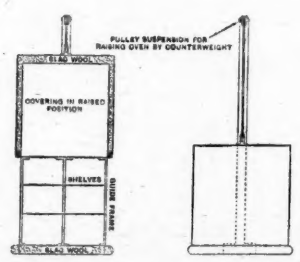


Fig. 1.—Electric Ovens: Consumption in Watts whilst raising to and maintaining Temperature at 400° F.

In some instances two or more curves are shown illustrating the same plate used with different current consumption, and it is interesting to note the results obtained from such tests. Every plate will give its maximum efficiency at a certain current consumption and if that consumption is increased additional energy is required to raise the plate to a higher temperature, and radiation losses are also increased; whilst in running the plate with a lower con-



Inner frame, carrying shelves, also outer covering in section. Oven in position, with suspension, side view.

Fig. 2.—Prentice Model Oven.

sumption the additional time required to perform the work accounts for increase in radiation from hot plate and kettle. It will be noticed that the watts dissipated per sq. in. of heating surface vary considerably; but, apart from the question of efficiency, it is not advisable to exceed, say, 40 watts per sq. in., as there will be a tendency for the hot plate to overheat, at the risk of injury to the insulation. The heating element should consist of nichrome wire, so arranged that it will dissipate heat uniformly throughout its length, and distribute it over the whole of the plate.

In fig. 5 are given some results obtained whilst investigating the insulating properties of mica when working with high temperatures. It will be seen that, with rising temperatures, the insulation resistance falls steadily until a point is reached at which, and beyond which, the insulation improves. The tests disclosed the existence of a critical point in the life of mica, for, with the temperature maintained at or about a certain point, the mica becomes brittle, and ultimately allows the resistance wire to break through it. It will be seen that two samples of mica tested changed at about 1,200° and, as the wire of a hot plate runs at about 600°, there is no very large factor of safety, which points to the desirability of improved insulation for this class of work.

There is generally much room for improvement in reducing the amount of metal present, and limiting the excessive losses due to radiation. The G.E. Co. of U.S.A. have shown marked attention to these two points in the design of their 4-in. hot plate, and, on account of the metal being provided with a bright nickel surface, the radiation losses of a Hot-point plate are minimised. It was found that when they had attained their final temperature, the Hot-point and G.E. hot plates respectively radiated 22 per cent. and 24 per cent. of the energy put into them. The bottom of the hot plate should consist of some strong material of high value as a heat insulator, rather than of iron, as is usual at present.

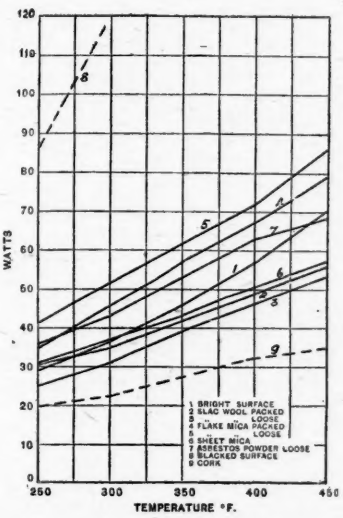
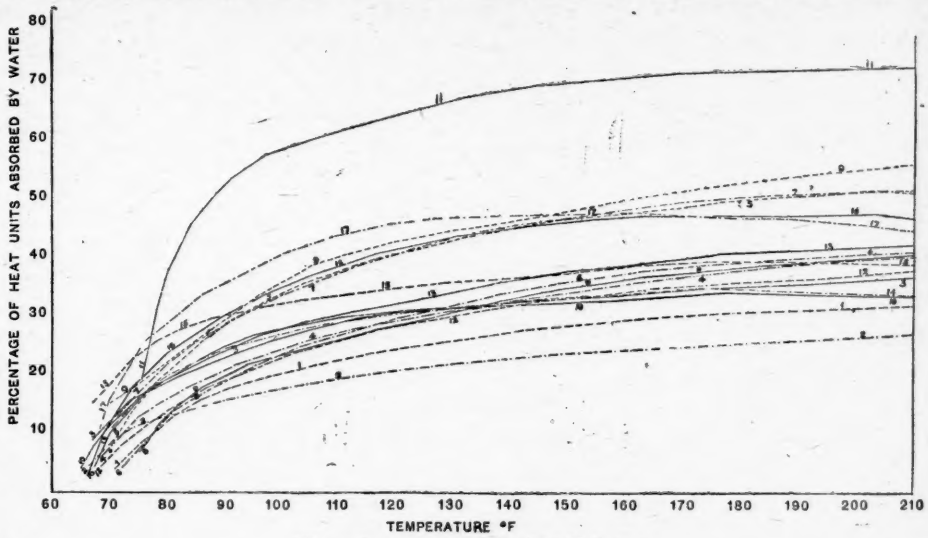


Fig. 3.—Laggings: Comparison of Efficiencies.

Hot plates are generally made with a considerable amount of iron, with the idea that it will act as a buffer and dissipater of heat in the event of the vessel in use being removed and current not being switched off. To avoid this I have devised a simple form of automatic switch, which works in the following manner:—When the weight of the kettle is removed, the hot plate or stand is tilted, causing mercury amalgam in a tube to run down to one end, and so opening the electrical circuit. In preference to using hot plates for boiling water, kettles with self-contained elements will be found quicker, and much more efficient. The heater, encased in copper, should be placed in a false bottom of the kettle, the copper being in metallic connection with the same, so that the heat may be directly conducted to the water.

Another article which has not been largely used up to the present, but possesses great advantages both in efficiency and general utility, is the immersion heater, of which the flat disk type made by the A.E.G. Co. is an excellent example. This is provided with three different ranges of heat, and can therefore be used either for simmering or boiling. Unfortunately, with present rates of charge for energy, the economical heating of water in large quantities is not practicable.



The numbers correspond with the table below.

Fig. 4.—Hot-Plate Efficiencies.

Owing to the perfect control of temperature and the absence of currents of air in the oven, the loss of weight of meat during cooking is considerably less than is the case with other sources of heat. The generally accepted figure for gas is from 25 per cent. to 30 per cent. of the initial weight, whereas the following figures have been obtained with electric cooking under ordinary working conditions:—

Ordinary weight of joint. lb.	oz.		Loss during cooking. oz.		Percentage of loss.
3	4	...	7	...	13·46
4	12	...	12	...	15·78
4	8	...	12	...	16·6
4	7½	...	12¼	...	17·1

In cooking meat it is advisable to raise the oven to from 400° to 450° F., and then insert the joint, and, after the meat has been subjected to this temperature for about 20 minutes to close the pores thoroughly and seal up the juices in the meat, the temperature should be maintained at about 300°. In this connection it is noticeable how commonly electrically-cooked meat is remarked upon for its excellence of flavour. Further, electricity is particularly suitable for casserole cooking, and the merits of this method of cooking are unquestionable.

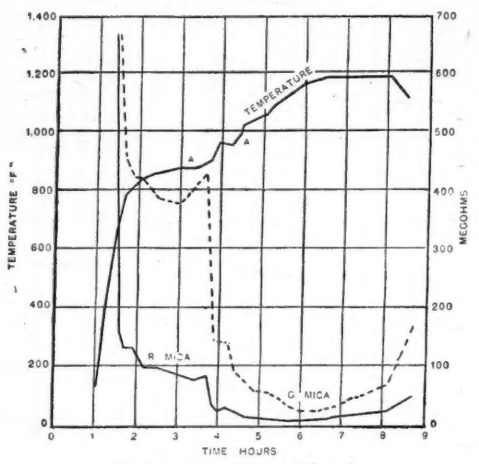
With a view to disproving the oft-expressed opinion that the cost of cooking by electricity is so excessive as to restrict its use to the wealthy, I append the records of the cost of same in two installations, giving the number of persons composing the households of each. These figures are based upon the present rate charged by the Melbourne City Council, but it is only reasonable to expect that

Hot Plates.—Comparative efficiencies when raising 3 pints of water (in 7-in. tin kettle) to boiling point.

Make.	Diameter of hot plate. Inches.	Rate of consumption in watts.	Watts per sq. in. of hot plate.	Time in minutes taken to boil.	Average efficiency throughout test.	Momentary efficiency at end of test.
Archer... ...	8	1,355	26·95	20·5	32·2	40·0
G.E.C. of U.S.A.	8·5	1,341	23·63	26·25	27·2	31·5
Simplex ...	6·5	1,070	32·30	24·0	37·0	40·5
Eclipse... ...	7·25	1,030	24·97	22·75	41·0	42·6
Nightingall ...	7	884	20·31	20·25	51·8	60·9
Tricity... ...	7	871	22·61	25·0	41·4	50·0
Bertram Thomas	7	848	22·15	21·0	52·0	59·5
Eclipse... ...	7·25	810	19·61	27·5	41·0	54·3
Hot Point ...	6	650	22·98	25·5	56·4	73·7
Gen. Elec. Co.	8·5	647	11·41	45·5	33·8	31·8
Gen. Elec. Co.	4	562	44·75	22·25	72·8	73·5
Simplex ...	6·5	560	16·88	44·0	38·3	56·5
Eclipse... ...	7·25	536	12·96	41·0	42·6	55·0
Gen. Elec. Co.	8·5	356	6·27	77 0	34·0	30·9
Simplex ...	6·5	326	9·85	75·0	39·2	38·6
Nightingall ...	7	321	8·35	62·0	47·5	40·3
Tricity... ...	7	216	5·62	96·0	45 2	44·0

any considerable demand for current for this purpose would be met with an adjustment of tariff.

It may be anticipated that the consumption for cooking will be fully five times the amount required for lighting. The rate at which current is taken, and the time of day at which demand is made, are very important points to the electric supply undertaker, and will have a material bearing upon the rate to be



Rising temperature checked at A.

FIG. 5.—EFFECT OF TEMPERATURE UPON MICA.

charged. Although the daily load factor of the supply (*i.e.*, the ratio of mean demand to the maximum) to the individual installation is very low, there is a considerable diversity in regard to the time of day at which the maximum demand occurs, and consequently the average load factor throughout a year or for a number of installations will probably be of a much higher order, and in the vicinity of 25 per cent. to 30 per cent. per annum.

WEEKLY COST OF COOKING.

HOUSEHOLD A.—TWO ADULTS AND TWO CHILDREN.

Week.	Apparatus used.	Units used per week.	Weekly cost at 1½d. per unit.
1.	Tricity outfit	23·3	3/4·7
2.	Tricity outfit	22·6	3/3·5
3.	Tricity outfit, with a Nightingall kettle	19·3	2/9·7
4.	Do.	16·3	2/3·7
5.	Do.	17·1	2/5·0
6.	Do.	20·7	3/0·0
7.	Do.	15·2	2/2·6
8.	Nightingall non-auto stove, with a Nightingall kettle and A.E.G. immersion heater ...	18·0	2/7·5
9.	Do. do.	13·7	1/11·9
10.	Do. do.	13·3	1/11·3

HOUSEHOLD B.—THREE ADULTS.

1.	Eclipse outfit	42·0	6/1·5
2.	Do., with a Nightingall 5-pint kettle and two G.E. 4-in. hot plates and immersion heater	29·5	4/3 6
3.	Nightingall non-auto, with two G.E. hot plates, kettle and immersion heater	26·5	3/10·3
4.	Do. do.	20·2	2/11·3
5.	Do. do.	15·9	2/3 8
6.	Tricity outfit, with immersion heater and Nightingall kettle	18·2	2/7·8
7.	Tricity outfit, with Nightingall kettle	14·1	2/0·7
8.	Do. do.	12·1	1/9·2
9.	Do. do.	10·8	1/6·9
10.	Do. do.	14·0	2/0·5

To avoid the use of separate tariffs for cooking and lighting, it will probably be found advantageous to charge for all energy required for domestic purposes at a special domestic rate on some such lines as the following :—

(*a*) A fixed monthly sum per KW. of maximum demand to cover the capital charges entailed to supply same.

(*b*) A charge of ——— per unit to cover the supply costs.

A device would have to be installed limiting the maximum demand of each consumer, but he would have the power of increasing this amount at any time should it prove inadequate. Such a system of charging would undoubtedly have the effect of improving the load-factor, and at the same time would greatly encourage the use of domestic appliances. For instance, the dinner being cooked, the consumer could use the current for radiators at probably less than half the present rate charged for it.

At the present time the majority of cooking outfits cost from £15 to £20. This may not be a serious objection to the wealthy, but the middle-class householder will want a complete outfit at from £5 to £6, and I see no reason why this demand should not in time be met. The apparatus should preferably be installed and connected by the supplier of the article, so as to avoid division of responsibility. It is absolutely necessary that this work be carried out in the best possible manner, and that every care be taken to ensure reliability of working and to avoid possibility of shock.

The selection of suitable switches is an essential point, as a number of those at present on the market cannot be relied upon for regular and continuous work.

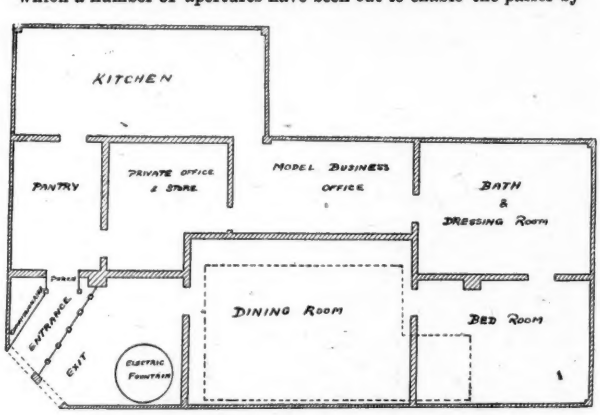
From a safety point of view, it is necessary that all apparatus should be earthed, if installed in such a position that it is possible to touch it and make contact with independent earth at the same time. Ordinary flexible cords are a source of weakness, and where possible should be replaced by flexibles with an earthed armouring. Judicious use of pilot lights is also desirable in order to keep down the consumption of current, to save the apparatus from overheating, and the cook from the chance of burning herself.

A wide field of usefulness awaits the application of electric heating in the home. As an illuminant it, of course, stands unrivalled, and as the cleanest, healthiest, surest and most convenient source of heat and power, it will rapidly gain favour as a means of cooking and room heating, and in connection with those varied mechanical appliances to which the housewife will turn, to find at least a partial solution of the domestic labour problem.

LA MAISON ELECTRIQUE AT OLYMPIA.

THROUGH the agency of the Electric Supply Publicity Committee, a number of London Electric Supply Companies are arranging an electrical exhibit at the forthcoming Ideal Home Exhibition, which opens at Olympia on October 9th next. The exhibit will take the form of a fully equipped electric house, and will be known as "La Maison Electrique." This title has been chosen for the reason that the most striking features of "La Maison Electrique," which has been so successful in Paris, are to be specially brought over for this occasion. The chief of these, of course, is the electric dining table illustrating the possibility of a dinner being perfectly served without the visible intervention of servants. Thus M. Knap's wonderful dining table with its ingenious combination of electrophone, periscope, service lift and travelling rails and its accompanying decorative details, however unattainable it may be for the ordinary householder, will serve to draw the attention of all visitors to the Committee's stall.

This will be arranged on the plan shown below. The exterior will present the appearance of a building in old English style, in which a number of apertures have been cut to enable the passer-by



PLAN OF LA MAISON ELECTRIQUE.

to look into the rooms. The entrance and exit will be through a garden forecourt daintily dressed with climbing roses and flowering plants, and containing an ornamental fountain illuminated from below by coloured lights.

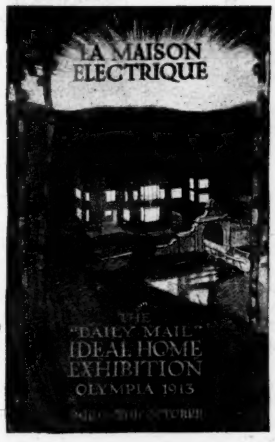
Those who wish to make a closer inspection of La Maison Electrique than is possible from a walk round outside, will be admitted on presentation of visiting card or on signing the visitors' book, and small parties, each in charge of a demonstrator, will be conducted through the suite of rooms forming the interior. These rooms in the order visited are: pantry, kitchen, business office, dressing and bath room, bedroom and dining room, the tour ending by the visitors seating themselves at the dining table and taking part in its operation.

In the course of their tour the visitors will have had their attention drawn to every style of electric lighting available for domestic purposes, special ceilings being erected in the office and dining-room for the display of indirect and semi-indirect fittings. They will also have seen every kind of apparatus for heating, cooking, ventilating, ironing, cleaning, polishing, and many other operations. These will all be shown in actual use, the bigger articles being in charge of special attendants, whose duty it will be to keep them in constant operation.

It may be stated that the staff employed at La Maison Electrique to maintain it in full activity will number nearly 30, and we are

informed that no effort will be spared to provide the public with a show at once instructive and interesting.

Over 100 electrical appliances will be displayed, and the great difficulty before the Committee has been to avoid showing more than one or two types of the same thing. This difficulty has, however, been avoided, except in the case of appliances such as radiators, vacuum cleaners and fans, of which it is possible to show a different make in each room. No duplicates will be found together in any one room. One purpose achieved will be to show the public that there is hardly a single piece of domestic work to which electricity may not be applied with advantage. The possibility of mere bewilderment at this hurried lesson in electricity counteracting its educational value, has been foreseen, and each visitor to La Maison Electrique will be presented with a 30-page booklet containing information and argument in favour of the cleanliness and convenience of the electric domestic service. In the production of this book the assistance of a large number of manufacturers has been secured. An edition of 100,000 copies is being prepared, and it is hoped that the good work of the exhibition will be supplemented and carried on for many months by the presence of this book in the homes of those who have visited La Maison Electrique. In order to attract attention to the House, the Committee has produced an effective poster, of which some 4,000 copies will shortly appear. These will naturally be displayed, so far as the Electric Supply Publicity Committee is concerned, in the districts of those companies which are bearing the



La Maison Electrique Poster.

financial burden of this enterprise, but all who wish to excite the interest of their own local residents can buy copies from the Committee. A reduced reproduction of this poster is given above. It is also issued in the form of a coloured postcard, and as a label for attaching to correspondence, and supplies of these may likewise be purchased by those who desire to make use of them. As our readers already know, a strong bid for popular favour is shortly to be made at the National Gas Exhibition, and it is considered that the Ideal Home Exhibition affords an opportunity for providing an antidote to the impression that the gas companies will seek to create. We are informed that it is offered to the electrical industry in London and the surrounding districts through the public enterprise of a few only of the many undertakings operating in the area, and the fullest advantage should be taken of it. It is to be regretted that financial support has not been given more widely, but we learn that those who are associated on this occasion will be content if their action results in better co-operation for the future.

LEGAL.

Electricity in Mines: Prosecutions.

At the Old Hill Police Court on Wednesday in last week, Messrs. Robert Brown Fellows, Ltd., proprietors of the Corngreaves Colliery, Cradley Heath, were summoned for unlawfully permitting certain cables in the mine, not being flexible cables for portable apparatus or signalling wires, to wit, cables in the main dip and in the roadway to the right at the foot of the main dip, not to be covered in certain parts with insulating material, contrary to Rule 12 of the electricity rules. They were summoned for unlawfully permitting the live parts of certain electrical terminals in the mine, to wit, the switchboard ammeter terminals in the 7-H.P. motor house in the main dip, not to be so constructed and installed that they were so protected or enclosed as to prevent accidental contact by persons, contrary to Rule 10 of the electricity rules. Two similar summonses were preferred against Isaac Meacham, of Perry Park House, Blackheath, the manager of the colliery. Messrs. Fellows, Ltd., and Mr. Meacham were further summoned under the Factory and Workshops Act for permitting a certain fuse to be in use in the electrical generating station which was not so constructed, or so guarded or placed, as to prevent danger from arcing or the scattering of hot metal when in operation, contrary to Regulation 5 of the electricity regulations.

Mr. Hugh Johnstone, Chief Inspector of Mines, who prosecuted, explained that electricity, for reasons of efficiency and economy, was largely used in coal mines, but if not properly installed and maintained, the apparatus was a source of great danger. It was of the greatest importance that all live parts should be sufficiently protected, for any failure in this respect might result in persons coming into contact with them receiving a shock, which, under ordinary conditions, might be serious, and under certain circumstances might prove fatal. The Government laid much stress upon this point, and also provided that examinations should be made and reports of them placed before the manager of the colliery. On May 27th last Mr. Felton, an Assistant Inspector, visited the pit in company with Mr. R. Nelson, an electrical inspector appointed by the Home Office, and in the course of their examination they found a number of defects in the electrical apparatus which might have had serious consequences. As a matter of fact, they discovered 16 bare parts in the cables. Each part constituted a separate offence against the Act, but he had decided to proceed upon two summonses only. They also found that the fuses at the generating station were so constructed as not to prevent danger from arcing or the scattering of hot metal when in operation.

Mr. Robert Nelson, electrical expert from the Home Office, said he visited the colliery on May 27th, and found there were two systems of electricity, a direct current with 220 volts, and an alternating system with 200 volts. Either of the systems would cause a shock which might result in a fatality. He followed the cable down the dip, and he found faulty wires, which showed evidence of poor maintenance. He also saw some bare parts. Near the bottom of the dip was a motor driving a pump, and close to the switchboard was an ammeter on which were bare terminals. On the road to the right at the bottom of the dip he found two defects in the cables. In the main road he saw thirteen defects, and one on the switchboard at the top of the dip, making sixteen in all. It would not require an expert to find them. A lamp had been cut away, and the ends were live.

In reply to Mr. W. Waldron, who defended, witness agreed that most of the bare parts had probably been caused by the dropping of some material from the roof. The inspection, it was added, lasted two-and-a-half hours, and all the defects could be repaired within two hours. Mr. Waldron submitted that as Mr. Robert Fellows took no part in the management of the colliery, he could not be held responsible. In the case of Mr. Meacham, he was not conversant with the electricity regulations, the work being delegated by him to a qualified electrician. He contended, therefore, that the latter was the proper person who should have been proceeded against.

In the result, Messrs. Fellows, Ltd., were find £2 and costs for permitting the cables to be exposed, and the other case against the company, that relating to the Factory Act, was dismissed on payment of costs. The cases against Meacham were also dismissed.

In Hamilton Sheriff Court on 5th inst, two prosecutions under the Coal Mines Act were called. In the first, Robert Wilson Dron, mining engineer, Bearsden, and James Dalglish, colliery manager, Motherwell, were the parties charged, the former being agent, and the latter manager of Dalzell and Broomside Colliery, Motherwell, occupied by the Wishaw Coal Co. The complaint libels 12 different offences in the mechanical and electrical fittings of the pits mentioned between March 15th and April 16th last. The electrical section of the complaint alleges (1) failure to have certain fuses in the distributing box forming part of the electrical apparatus in No. 2 pit so protected and enclosed as to prevent contact by persons; (2) failure to cover with insulated material a number of unarmoured cables; (3) failure to have properly secured by some non-conducting and readily breakable material certain cables; (4) in certain seams in No. 2 pit failure to take adequate precautions to prevent the signal wires getting attached to the cables therein; (5) failure to have an earth conductor at the gate-end box in the black-band seam of No. 2 pit; and (6) failure to have a flexible cable for the portable apparatus in the pony level. In the second prosecution, James McNeil, colliery electrician, Wishaw, is charged with eight offences, all relating to alleged defects in the electrical apparatus and equipment of the colliery for which he is responsible. Before the respondents were asked to plead, the Fiscal agreed to an adjournment of the cases so as to permit a discussion on certain pleas dealing with the relevancy of the charges.

In the Hamilton Sheriff Court on Friday last, a point was raised before Sheriff Hay Shennan in reference to the statutory duties of colliery electricians. The matter arose in connection with a prosecution, at the instance of the Home Office, against James McNeil, colliery electrician, Wishaw, who was charged with permitting defects in the electrical apparatus and equipment of Dalzell and Broomside Colliery, Motherwell.

Mr. Nicol F. Cameron, writer, Glasgow, who appeared along with the respondent, submitted that the first seven of the eight charges formulated were irrelevant. The duties of an electrician under the Special Rules were the examination of apparatus, the

examination and testing of new apparatus and the keeping of a log-book. There was nothing in the Rules about supplying anything. In the complaint there was reference to four fuses, which respondent was charged with having failed to see properly constructed and installed; and he was also alleged to have failed to keep certain coverings, earth conductors and flexible wires properly secured. He submitted that these were outside respondent's duties.

The Fiscal said that if Mr. Cameron's interpretation of the Rules was correct, the whole tenor of the Act was to be disregarded, as, according to the view now submitted, the electrician was a non-entity at a pit. The electrician, he held, had to discharge his duties in accordance with the whole of the electrical Rules, and not merely a particular section of them.

Sheriff Shennan said he would reserve judgment on the point raised, but in respect of the eighth charge, he fixed **Friday, 26th** inst., as a diet for proof.

Sheriff Shennan on Monday issued a written judgment, in which he gave his opinion that the objection to the relevancy must be sustained. His Lordship said he failed to find any duties specifically imposed on the electrician, except those contained in sub-heads (*c*) and (*d*) of Special Rule 14, namely, (1) the thorough examination of all apparatus as often as may be necessary to prevent danger; (2) the examination and testing of new apparatus and of apparatus re-erected; and (3) the keeping of a log-book. He did not find what might be called executive duties imposed on the electrician. It seemed to him (Sheriff Shennan) that the scheme of the Rules was to put the electrician in the position of technical adviser, and the results of his examination and inspection being entered in the log-book, it then became the duty of a colliery manager to see that the necessary work was carried out.

Workmen's Compensation.

Joseph Clegg, of 34, Roundthorn Road, Oldham, whilst employed as a labourer by the Brush Electrical Engineering Co., Ltd., of Falcon Works, Loughborough, injured himself at the Oldham Corporation Electricity Works on October 22nd, 1912, by falling through a movable floor. Until January 27th, 1913, Clegg was totally incapacitated from work, but he has since been continuously employed at a lighter task. He received 16s. 10d. per week as compensation till March 31st, and the company now paid £20 to terminate the liability. At the Oldham County Court on Thursday last week, applicant was allowed that amount.

An Acquittal.

Before Judge Lumley Smith, at the Central Criminal Court, last week, Hubert Eustace, 41, described as a traveller, was found not guilty of a charge of obtaining three small sums of money by false pretences from his employers, the Electrical Co., Ltd., of Charing Cross Road, W.C., and was discharged.

The X.L. Electric Co.'s Litigation.

A further stage in this litigation was reached when on Wednesday, September 17th, application was made to Lord Justice Swinfen Eady to stay proceedings under the order made by the Vacation Judge the previous week in the debenture-holders' action of Wiener *v.* the X.L. Electric Co., Ltd., restraining the company from abandoning an application for final protection of an invention sold by Mr. Aron to the company.

The application was made under Sec. 52 of the Judicature Act of 1873, and his Lordship was asked to make an interim order to prevent the claim of the defendant company being prejudiced pending the hearing of an appeal.

Counsel, in support, stated that Mr. Justice Bailhache as Vacation Judge had made what was in effect a mandatory order, after hearing merely a short statement of facts and without having the respondent's evidence before him.

His Lordship pointed out that he was not hearing the appeal; all he had to do was to see that the applicants were not prejudiced by the interim order. How, he asked, would they be prejudiced if they complied with the order?

Counsel said that there was an application pending for a further patent which was partly comprised in the patent in question. The new patent would come within the plaintiff's charge, so he would in no way be prejudiced.

Counsel for Captain Wiener pointed out that the new patent was being applied for by Mr. Aron and Mr. Harrison, both of whom were hostile to him.

His Lordship said the application was made on insufficient evidence. He thought the applicants had made out no case for any interference with the order made by the Vacation Judge. The application therefore failed, and must be dismissed with costs. His Lordship added that he was, of course, merely dealing with the matter of prejudice, and nothing he had said would in any way affect the appeal.

Concert.—The Fulham branch of the Electrical Trades Union held a smoking concert at Fulham Town Hall on Saturday last, September 13th, in aid of the widow and five young children of the late Brother Alexander Sinclair. Mr. John Pearce, of 11, Bendemere Road, Putney, acted as hon. secretary.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Townshend's New Table Cooking Devices.

A new coffee machine has recently been developed by Messrs. Townshend's Art Metal Co., Ltd., of 62, Holborn Viaduct, E.C. The apparatus is based on a well-known system of coffee extraction, which has been simplified and adapted to electrical working, and is illustrated in fig. 1. When current is switched on, hot water is raised from the highly plated metal flask into the upper glass bowl, where it is agitated with the ground coffee by steam bubbling through it from below. When the current is switched off, the residual heat in the element is sufficient to complete the process of making the coffee, which is then automatically forced through a filter pad by atmospheric pressure. The coffee produced contains

Fig. 1.—Townshend Coffee Maker.

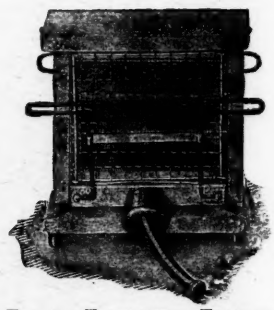


Fig. 2.—Townshend Toaster.

the whole of the soluble extracts from the berry, and is absolutely free from sediment. If hot water is used, and current applied from any ordinary lampholder, the cost of the electricity consumed is inappreciable, being about $\frac{1}{30}$th of a unit.

As the heating is effected by the condensation of steam, the temperature is never great enough to drive off the volatile oils from the coffee, and the whole of the aroma and fragrance of the coffee is retained in the infusion.

The toaster illustrated in fig. 2 has been specially introduced to meet the demand for an effective toaster at a moderate price, and is ornamentally constructed in hammered aluminium and nickel-plate. In addition to being an ornament to the table, it is scientifically constructed, the heating element being carefully graduated to produce a uniform temperature over the whole of the toasting surface—no gaps are permitted. As the element is run at a temperature below red heat, the effect of oxidation is eliminated, so that the apparatus is practically indestructible. Care is taken that both heat and electricity are insulated. Non-conducting feet are provided, and the electrical connection is made of one piece of substantial material, provided with a spring to prevent wear on the flexible cord. The current taken is 1½ amperes, so that it can be connected to any lampholder without special wiring. The toast produced is uniformly browned, and is crisp without becoming dry.

"Lotolite" Glassware.

The British Economical Lamp Co., Ltd., of 9, Old Bailey, E.C., are marketing, amongst various patterns of crystal glass reflectors, the two types illustrated in figs. 3 and 4, the former

Fig. 3.

Fig. 4.

"Lotolite" Crystal Fittings.

being a concentrating hemisphere used with a reflector to give uniform floor lighting and suitable for shop lighting, &c., and the latter a distributing sphere for giving uniform lighting in all

directions, the lamp being entirely enclosed. The sphere is particularly well adapted for the lighting of public rooms, hotels, cafés, &c. Both glassware and fittings are supplied, the sizes varying from 10 in. to 16 in. diameter.

Ironclad Crane Panels.

A new form of crane panel has recently been designed by the General Electric Co., of 67, Queen Victoria Street, E.C., which is intended to meet the very exacting demands of crane work. It consists of a standard Salford switch and a distribution board mounted on a strong iron framework, together with pilot lamps and an inspection lamp plug. The switch is completely separate from the distribution board, and the main fuses are contained in the switch case. These fuses are enclosed in separate fireproof compartments, and the interior of the case is protected by insulating material against any arc from the switch.

The inspection lamp plug is connected to the top contacts of the switch, so that the crane driver can use the light irrespective of whether the main switch is open or closed. In order to afford the operator an indication as to whether the power is on his controller, two pilot lamps are provided which are alight the whole time the

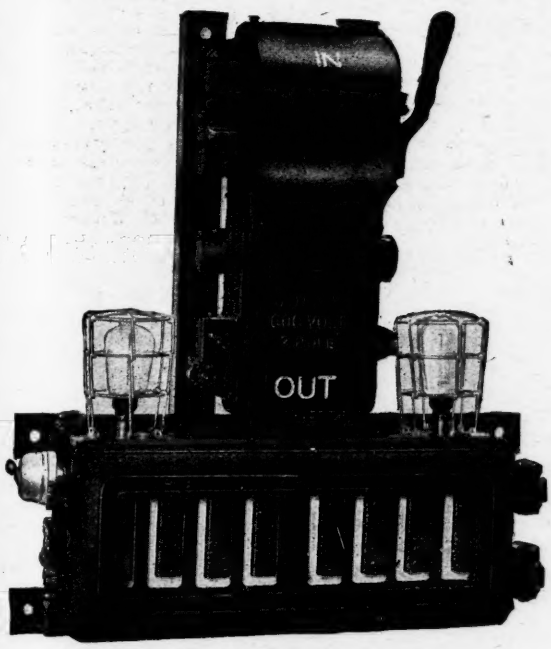


Fig. 5.—G.E.C. Ironclad Crane Panel.

switch is closed. The switch blades are interlocked with the cover of the switch, so that it is not possible to close the switch with the cover open, or to open the cover with the switch closed. Both the inspection lamps and the pilot lamps are protected by fuses fixed on either side of the switch case.

In view of the heavy loads which may be imposed upon the fuses in the distribution board, great care has been taken to ensure that the clearances between the fuses are adequate, and no attempt has been made to sacrifice safety to compactness. The fuses are of the Home Office pattern, and it is impossible for the hand to touch a live part accidentally whilst inserting or removing a fuse. The cables from the bottom of the main fuses can be conveyed from the switch case to the distribution board in conduit. These crane panels are made for D.C. and A.C. work, in sizes from 50 to 200 amps. at 500 volts.

G.E. Co. Continuous-current Motor Starters.

The General Electric Co., Ltd., have developed a line of standard D.C. starters, in which facilities are provided for the renewal and adjustment of those parts subject to the most wear. The new patterns range from ¼ H.P. to 100 H.P., for pressures up to 500 volts. A noteworthy feature in the small sizes is a self-aligning contact block, which adapts itself to the irregularities in the contacts which inevitably occur in practice through arcing. The contacts of all G.E.C. starters are ground true in place on the face plate. Several outside improvements have also been included in the larger sizes, Nos. 4 and 5. No. 5 is shown open in fig. 6. All the contacts are renewable from the front, so that should one require replacement, it is only necessary to take out two screws and it comes away bodily. In the running position the resistance is short-circuited by a brush, and both the stops against which this short-circuiting brush rests are adjustable, so that if, after considerable wear, the brush exerts an uneven pressure on the two contacts, they may be readily adjusted. No-volt coils are usually set to release at 75 per cent. of the normal voltage, but users are often mistaken in the exact voltage of supply. They overstate the pressure, with the result that the no-volt coil may sometimes have an insufficient holding-on power. To meet this in the G.E.C. starters, the no-volt coil is made detachable, and special instructions are sent out attached to each no-volt coil so that, should it not hold on sufficiently well, the user will know how to take it out for return. This can be performed in a few seconds. For making the main contact in the larger sizes of starters there

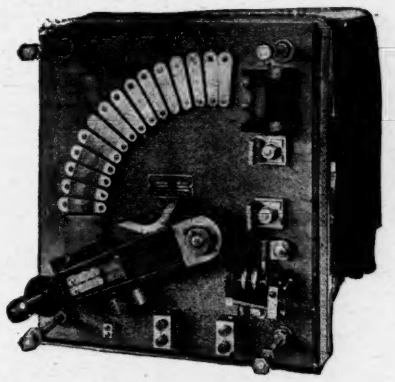


Fig. 6.—Type 5 G.E.C. Starter with Cover Removed.

are two brushes, one a carbon brush and the other a brass or copper brush, the carbon brush taking any arc that may be formed, and so preserving the contacts. Other features are a self-aligning contact block, solid terminals for the incoming cable, and an overload trip adjustable over a wide range. These starters are built in the open, semi-enclosed and totally-enclosed cover patterns, the latter having a window, through which the contacts may be inspected. A waterproof pattern can also be supplied.

BUSINESS NOTES.

Half-Watt Lamps.—In connection with recent Press announcements regarding this epoch-marking invention, we are asked by the General Electric Co., Ltd., of 67, Queen Victoria Street, E.C., to state that the Osram works are at the present time manufacturing half-watt lamps under full patent rights, and will be in a position to place same on the market in the very near future.

Strike in Russia.—A strike of 250 employés of the Allgemeine Electricitäts Gesellschaft at Riga has taken place.

Embezzlement in Sweden.—At the Helsingfors branch of the Allgemeine Elektricitäts Gesellschaft embezzlements to the extent of £10,000 have occurred. A female cashier and a manager have been arrested.

Electric Sign Business.—A London evening paper last week contained a prediction by Mr. A. H. Brackensieck, of the Franco-British Electrical Co., Ltd., of a coming boom in electric advertising signs. He said that during the last 10 years the rent of good wall spaces for electrical sign advertising had increased by between 100 per cent. and 150 per cent. Despite this increased cost he says that there is undoubtedly a boom in prospect for the new method of advertising. Big American cities have gone the "whole hog" on big animated signs, and Paris and Berlin are far ahead of London in advertising devices. But London is waking up. Glasgow is the next British city and Liverpool third in importance to go in for the new method. An order for an electrical sign in Hindustani came from India. The "clown juggling sign," which popularised Terry's cinema in the Strand, has been copied in Bristol and Glasgow, and is to be copied in Hong Kong. The juggling will there be done by a clown and a Chinaman. Some novelties in advertising in London are promised shortly.

Private Arrangements.—Thomas Osborne Morgan (trading as the South Wales Accessories Co., formerly the Electrical Wiring and Accessories Co.), Boot Chambers, Market Street, Aberdare, wholesale electrical, motor and general engineers' merchant. —A meeting of the creditors interested in the above matter was held on Thursday, September 11th, at the offices of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, London, E.C., when Mr. Rich, representing Messrs. Siemens Bros. Dynamo Works, Ltd., was elected to the chair. A statement of affairs was presented showing liabilities amounting to £2,474, and net assets £834, or disclosing a deficiency of £1,640. The liabilities were made up of the claims of trade creditors, £839; cash creditors (debtor's father, £500; debtor's wife, £300; bank overdraft private account, £304; business account, £451), £756; and contingent liability expected to rank, £79. The assets were as follows: Stock-in-trade (£519), estimated at £386; fixtures and fittings (£46), estimated to produce £23; office furniture (£22), valued at £11; motor-car (£100), expected to produce £50; good book debts, £350; doubtful and bad book debts (£247), expected to produce £30; and cash in hand £4. The assets, therefore, totalled £856, from which had to be deducted preference claims amounting to £22. Mr. Houston (Messrs. Corfield & Cripwell) dealt with the statement of affairs. Considerable discussion took place. Mr. Thomas, the debtor's

solicitor, said that a writ had been issued, and something had to be done to protect the whole of the creditors. He personally knew the debtor's father, who was in a very good position, and one of the best respected men in Aberdare. Mr. Morgan, the debtor, entered the business when electricity was just being introduced into Aberdare. An electrical scheme had just come into force in the town, and the speaker thought that if the debtor was given an opportunity of going on he would be able to recover himself. Mr. Morgan, he said, had not neglected the business in any way, he was a very good worker, and he thought there was every prospect of the business being carried on successfully in the future. He was authorised to offer a composition of 5s. in the £, cash down. The creditors present declined to accept this offer, and pressed for 10s. in the £, but Mr. Thomas said he could not possibly see his way to offer this. After conferring with the debtor, however, he said he would stretch a point, and increase the offer to 7s. 6d. in the £ off his own bat, as it were. After some discussion, it was proposed by Mr. Rich (Siemens Bros. Dynamo Works, Ltd.,) and seconded by Mr. Hodd (Falk, Stadelmann & Co.), that a deed of assignment should be executed in favour of Mr. C. E. Corfield, with power to resell the estate to the debtor's nominee for a sum equal to 7s. 6d. in the £ on the amount of the liabilities to trade creditors, and all expenses incidental to the deed and costs of suing creditors, the cash necessary for the composition to be deposited with the trustee within 14 days, the trustee to have the power to realise the estate in the event of the money not being deposited as agreed. A committee of inspection was also elected. The following are creditors :—

Armorduct Manufacturing Co.	£65	Kynochs, Ltd.	£73
British Westinghouse Co.	12	Metallic Seamless Tube Co.	23
Calmont, King & Co., Ltd.	92	New Gutta-Percha Co., Ltd.	18
City Glass Co.	15	Spencer, J. E. & S.	20
Crosbie, Marriner & Co., Ltd.	12	Siemens Bros. Dynamo Works, Ltd.	101
Drake & Gorham, Ltd.	28	Simmons, E. & R., Ltd.	19
Electric and Ordnance Accessories Co., Ltd.	63	Wholesale Fittings Co., Ltd.	14
Falk, Stadelmann & Co.	22	Creditors under £10	217
General Cable Manufacturing Co.	40		

Book Notices.—"The Management of Public Electric Supply Undertakings." By A. Hugh Seabrook. 1913. London: Office of *Electrical Times*. Price 7s. 6d. net.

"The President's Address and Sectional Addresses at the British Association Meeting, Birmingham, 1913." London: The Offices of the Association. Price 2s.

"*Transactions* of the University of Toronto Engineering Society." Vol. VIII, No. 4. August, 1913. Toronto: The Society.

"Determination of Sulphur in Illuminating Gas." By R. S. McBride and E. R. Weaver. "Dehydration of Clays." By G. H. Brown and E. T. Montgomery. Washington: The Government Printing Office.

"*Journal* of the American Society of Mechanical Engineers." September, 1913. New York: The Society. Price 35 cents.

"*Journal* of the American Institute of Architects." August, 1913. Harrisburg, P.A.: The Institute. Price 20 cents.

"*Bulletin* Mensuel of the Société Belge d'Electriciens." Vol. XXX. August, 1913. Brussels: E. Bruylant. Price 1 fr. 75 c.

"*Bulletin* of the Association des Ingénieurs Electriciens." Vol. XIII, No. 6. August 30th, 1913. Liége: The Association. Price 5 fr.

"Atti della Associazione Elettrotecnica Italiana." Vol. XVII, No. 16. August 30th, 1913. Milan: Stucchi, Ceretti & Co. Price L. 1.50.

The Central for September contains, amongst other interesting items, articles on Cable Laying in the Antipodes, by B. S. Lion—an expedition in which five old Centralians were engaged; the Low coal engine and petrol engine; the Leclanché Battery, by M. Solomon; and the Science of Eating, by Dr. E. F. Armstrong—altogether a very good issue.

A neat folder giving standard metric equivalent tables, based on official figures, has been issued by the Central Translations Institute, of 265, Strand, W.C., and is arranged in a very convenient form for quick reference.

Bankruptcy Proceedings.—Roger William Wallace, K.C., 36, Campden Hill Gardens, Kensington.—A first meeting of creditors was held at the London Bankruptcy Court on 12th inst., when Mr. Egerton Gray (Official Receiver) reported that the debtor had submitted a statement of affairs showing unsecured liabilities £73,678 and assets estimated to produce £75,070. For some years his income at the Bar averaged £6,000 or £7,000 per annum. During the last five or six years he had given practically the whole of his time to experimenting in chemistry and had patented inventions for the making of nitric acid, ammonia, and various by-products from the electrical treatment of air. No company had yet been formed in connection with them, but the debtor valued them at a quarter of a million; he had been interested in some 20 public companies and was at the present time a director of seven, his fees amounting, roughly, to £1,300 per annum. The principal debt, £35,000, was due to Mr. Henry Du Cros, in connection with Gas Traction, Ltd. Debtor does not admit that he is insolvent, and attributes his position at the moment to the general financial depression during the last year, which precluded the finding of the capital necessary to finance his inventions. He considered that there would be ample funds for all his creditors if he were left to deal with the patents. Mr. Burn asked for the meeting to be adjourned for three weeks, to enable a scheme of arrangement to be submitted. Mr. H. Crewdson Howard, chartered accountant, was appointed to act as trustee and administer the estate in bankruptcy, with the assistance of a committee of inspection. The Chairman will give debtor eight days' notice of his application to the Court for an order of adjudication.

John Dale Nixon (J. D. Nixon & Co.), electrical and mechanical engineer, 65, Mill Street, Crewe.—Receiving order made September 5th, on debtor's petition. First meeting, September 18th; public examination, September 26th.

C. H. Steel, electrical engineer, Bradford, late of Cardiff and Merthyr Tydfil.—Trustee (Mr. G. David) released July 21st.

— Prested, electrical engineer, St. John's Lodge, St. John's Park, Holloway.—A bankruptcy petition has been presented by H. Hall, and will be heard on October 1st.

F. L. Woilliard-Rigg and H. E. Scarborough, electrical and mechanical engineers, Halifax.—Supplemental dividend of 1s. 2½d. in the £, payable September 20th, at 12, Duke Street, Bradford.

American Factories in Canada.—The F. B. Sturtevant Co., of America, have decided to establish a factory at Galt, Ontario, where they will manufacture for the Canadian market their fans, blowers, heating and ventilating apparatus, &c. Governor Foss, of Massachusetts, is interested in this company, and relevant to the new enterprise he makes the following statement: "All over the United States the tendency among the principal manufacturing interests is toward the establishment of plants in Canada. This movement has been going on for many years, and it is estimated that from three to five hundred million dollars of United States capital is now invested in these Canadian plants. The Sturtevant Co. must join the procession in order to meet the conditions of the industry, for the movement has now proceeded to a point where corporations which fail to follow are faced with serious embarrassment. American manufacturers have completely filled the American market, and their production is now greatly in excess of the domestic demand. Under these conditions the expansion of their domestic plants is impossible, and it is becoming necessary for them to curtail production. This movement of American manufacturers to Canada could be stopped and they could remain intact in this country if it were not for the absurd conditions created by our tariff legislation."—*Commercial Intelligence.*

Catalogues and Lists.—Messrs. Simplex Conduits, Ltd., 116, Charing Cross Road, London, W.C.—Twelve-page catalogue of special designs of semi-indirect lighting fittings ranging from under a sovereign to £10. The firm supplies four different kinds of glassware for use with indirect lighting, namely, "Luxuro," "Intaglio," "Onyx," and "Alabaster." "Real Alabaster" bowls can be quoted for where required. In most cases the fittings are also made suitable for use with the new inverted dish-type of Holophane reflector for semi-indirect lighting, and prices are given for fittings using this glassware.

Mr. George Ellison, Victoria Works, Warstone Lane, Birmingham.—Sheet No. 404/1 giving description with illustrations, prices and dimensions of their totally-enclosed emergency switches of the self-resetting type for cranes, hoists, lifts, or for signalling purposes.

Messrs. Johnson & Phillips, Ltd., Victoria Works, Charlton.—Thirty-six-page catalogue ("K"), giving full information respecting their arc lamps and accessories. In the several sections there are published descriptions of the "Metroflam" flame lamp and the "Orb" enclosed-type lamp, with many pages of pictures giving examples of street, works, railway and other lighting effected by their lamps. Prices are tabulated clearly, and there is a comparative estimate of high-pressure gas and flame arc lighting. Illustrations and prices also appear of line resistances, transformers, choking coils, switches, control gear, brackets and pillars, and raising and lowering gear.

Messrs. A. Schonfield & Co. (Glasgow), 21, Hope Street, Glasgow.—Twelve-page pamphlet, containing illustrated description of the Grundy system of automatic temperature control and their patent hygienic "Hestia" electric stove. The control apparatus can be used on other types of heater as well. The Hestia stove is shown with and without luminous panel and also wholly luminous. Prices and other cost particulars are included.

Messrs. Siemens Bros. & Co., Ltd., Woolwich.—24-page catalogue (C. 535) containing brief particulars, illustrations and prices of their telephones and telephone switchboards for private installations.

Messrs. John Dugdill & Co., Failsworth, near Manchester.—32-page catalogue showing a great variety of applications of their patent movable fittings for electrical, gas, telephone, textile and engineering works, and other purposes. Prices are quoted.

Messrs. Scholey & Co., Ltd., 151, Queen Victoria Street, London, E.C.—No. 2 of the "Scholey Magazine" (September) contains a photograph of Mr. A. H. Stanley, of the London underground systems, notes on flame arc lighting with a description of the "Flarion" lamp, an illustrated article (part II) on the automatic electric lift, and particulars of the firm's other specialities including the "Indesca" bell transformer, the Vulcan electric wax melter and the Vulcan electric soldering tools.

Messrs. Belling & Co., Derby Road, Edmonton, N.—Twenty-six-page catalogue concerning Belling electric fires. Many patterns are illustrated for office purposes and private residence service. Features of the list include a combined heater and afternoon tea-tray and a large dog grate. Dimensions, particulars as to finish, and prices, are included.

The Adnil Electric Co., Ltd., Artillery Lane, London, E.C.—Twenty-page list (No. AE 77), of electric tools. Descriptive information is given relating to portable electric drills and grinders, bench drills, drill posts (mechanical and electromagnetic), commutator grinding outfits, electromagnetic chucks, fixing plates, &c. Prices, weights and dimensions are given.

For Sale.—Two second-hand de Laval steam turbines and shunt dynamos 34·5 KW. 230 volts, are offered for sale by the Devon County Asylum authorities. See our advertisement pages to-day for particulars.

Bennis Stoker Contracts.—MESSRS. E. BENNIS & CO., LTD., have recently secured the following orders:—

Mersey Railway Co. Power Station, Shore Road, Birkenhead.—Two chain grate stokers, 11 ft. wide by 9 ft. 2 in. long.
Keighley Electricity Works.—Two stokers and self-cleaning compressed air furnaces for an 8-ft. Lancashire boiler (repeat order).
Bexley Heath Urban District Council Electricity and Trams Department.—Two self-cleaning compressed air furnaces.
Stirling Electricity Works.—Four stokers and self-cleaning compressed air furnaces for 8-ft. diameter Lancashire boilers.

Catalogues Wanted.—MESSRS. PRINTZ & CO., LTD., Esk Street, Invercargill, New Zealand, want catalogues and export terms for electric fittings, motors and dynamos (A.C. and D.C.), electric signs, &c.

Electric Baths at Ilford.—In preparing the plans and estimates for the erection of swimming baths, the surveyor has been instructed to make provisions for two rooms for electric bath purposes.

Mill Lighting at Cawnpore. — The Victoria Cotton Mill, one of the largest of its kind in the Cawnpore district, is illuminated throughout with Osram drawn wire lamps. The lamps in question are installed principally over the looms and other machinery, and are continuously subjected to very severe vibration, which they withstand successfully. They took the place of the old carbon-filament lamps, and a sufficient saving in current consumption has been effected to enable the mill to entirely shut down one of the dynamos previously used for lighting purposes.

Electric Clocks for Southport.—The Town Council, on the 9th inst., decided to install a new electric clock at the Town Hall, connected up with 12 other new electrical clocks in the Town Hall and offices, but not to strike or chime, at a cost of £154.

Car-Building in Australia.—Councillor Naylor, in a report to the Prahran (Victoria) Council, said that he feared that the orders for new bogie cars to be given out by the Prahran and Malvern Tramway Trust were going out of the State as all other such work had done. One reason for this was that the Wages Boards had made the wages of car-builders higher in Victoria than in any other State.

Trade Announcements.—THE ELECTRICAL ENGINEERING AND EQUIPMENT CO., LTD., of 109-111, New Oxford Street, London, W.C., have secured the sole selling rights in this country for the electrical tramway and railway equipments formerly sold by the Via Co. These include a complete range of overhead line material, including poles and fittings, all standard types of strain insulators, section switches and lightning arresters, hangers, bolts, ears, frogs, crossings, rail bonds, automatic signalling systems, and so on. In addition, the firm have a special rail-cleaning car, particulars of which will be forwarded to anyone interested.

THE LEA RECORDER CO., LTD., of Manchester, have appointed their assistant, Mr. W. H. Lund, as their representative in London and the South of England. His address is 44, Caxton House, Westminster, S.W.

MR. R. B. BEATTIE, electrical light and power contractor, of Burnley, has opened a branch business in Willow Street, Accrington.

THE CRYPTO ELECTRICAL CO. announce that, owing to large and continued increase in business, they have again found it necessary to build an addition to their factory at Willesden; this new building increases the area by considerably more than double. The new factory is now being equipped with new plant, and will be in full working order within the next few weeks. This will enable the firm to put machines through in very much larger quantities than hitherto and will expedite deliveries.

MESSRS. TETLEY & CO., Salford, have removed to Exchange Buildings, 6, St. Mary's Gate, Manchester.

MESSRS. C. C. WAKEFIELD & CO., manufacturers of lubricating oils and mechanical lubricators, will, on September 29th, remove to their new offices, Wakefield House, 30-34, Cheapside, E.C.

LIGHTING and POWER NOTES.

Ballater.—A discussion took place at a meeting of the T.C. in regard to a proposal to have an electric light installation for the burgh, but no definite decision was arrived at.

Ballyconnell.—Last week Dr. McCarthy, L.G.B. Inspector, held an inquiry into the application of the Bawnboy R.D.C. for urban powers to carry through a scheme for the lighting by electricity of the town of Ballyconnell.

Barrow.—By the end of this month the T.C. electricity undertaking will give a supply of electricity to the air-ship shed being built by Messrs. Vickers on Walney

Bexhill.—The E.L. Committee, after considering the question of the supply of electricity for the purposes of cooking and heating, has decided that as regards houses where there is a substantial user for lighting purposes, current for cooking and heating may be supplied at a reduction, after 800 units per quarter have been consumed for like purposes, from 2d. to 1½d. per unit for additional units.

The L.G.B. has sanctioned a loan of £3,000 for mains and house services.

Bexley.—The U.D.C. on September 10th adopted a recommendation by the electrical engineer to install a 50-KW. rotary converter.

The Council has decided to amend the tariff for current for cooking and heating, so that under a guarantee consumers may be supplied at 1d. per unit over and above a minimum of 500 units per quarter.

Birmingham.—At a special meeting of the Electric Supply Committee, on the 9th inst., the tenders for the supply of coal to the department for the year commencing October 1st, were considered. The total required for the 12 months was 205,000 tons, 160,000 tons to be used at the Summer Lane station, 40,000 tons at the Chester Street station, and 5,000 tons at the station in Water Street. The aggregate amount of coal offered in the tenders was 1,451,000 tons. The Committee spent a considerable time over the matter, and eventually was able to place contracts at an average price which was slightly more favourable than last year. Twelve months ago the quantity of coal contracted for was 160,000 tons.

Bishop's Castle.—The Council has agreed to grant permission to an electric lighting company to supply electricity by overhead wires with wood or iron posts, the work to be completed in 12 months.

Bispham.—The U.D.C. has given formal notice that application has been made to the B. of T. for sanction to place electric transmission lines between points on Blackpool Road.

Blackpool.—In connection with the scheme for the Autumn illuminations, a commencement was made on the Princess Parade this week.

Burslem.—The Stoke-on-Trent T.C. has applied to the B. of T. for consent to utilise overhead wires at Burslem for the transmission of current at a pressure of 440 volts.

Canada.—The Winnipeg Electric Railway Co. find that their power plant at Lac Du Bonnet, on the Winnipeg River, 40 miles from Winnipeg, is unsatisfactory and fails to supply sufficient power for the wants of the company, necessitating the utilisation, very frequently of late, of the auxiliary steam plant. The company have decided to build another extensive power plant at Bonnets Falls, 20 miles nearer Winnipeg, also on the Winnipeg River. The contract for this work has been let to the J. B. White Company, for between four and five million dollars.

The inner working of the Ottawa municipal electric light plant is conducted in secret, and so the people know only results, which however, have been satisfactory. The refusal of the acceptance of the lowest tender, in a matter of $2,500, has been the cause of a sudden desire lately on the part of the ratepayers to have the business conducted in the open. The Electric Commission, on their part, object on the plea that on account of sharp competition it is necessary to conduct the business in secret.

A new agreement between the British Columbia Electric Railway Co., the largest electrical company in the West, if not in all Canada, and its employés, was signed on the 2nd inst., for two years. The present wage schedule was renewed, but the company made various concessions regarding hours and working conditions.

WINDSOR.—*Canada* states that the Essex Light and Power Co., a subsidiary corporation of the Edison Co., Detroit, will be able to supply power to Walkerville this month. The price, it is understood, will be $24 per H.P., which is considerably lower than the power rate included in the contract made by the City of Windsor with the Hydro-Electric Commission.

The *Canadian Engineer* states that the Canadian Northern Railway is about to install electric apparatus for the operation of the big elevator plant in Port Arthur, Ont. It is estimated that with the additional unit to be constructed to the elevator in the near future, the plant will require from 1,100 to 1,500 H.P.

Cheltenham.—Some switchgear and a transformer, costing £160, are to be provided in connection with the new condensing plant.

Crowle.—At the last meeting of the Council, complaints were made of the prices charged for the supply of gas—4s. 7d. per 1,000 ft. for private consumers with gas cookers, and 4s. 9d. per 1,000 ft. for ordinary consumers—and it was suggested that some other means of lighting should be considered.

Cuba.—Judging from reports just to hand, there is just now a large amount of electrical work in hand in Cuba, central electric lighting stations being in course of establishment in the towns of Madruga, San Nicolas, Cataluna de Guinès, Jaruco, Carebello, Bainoa, and San Antonio, in the Province of Habana: at Jovellanos, Calimete and Manguito, in the Province of Matanzas; at Moron (Province of Camagues); and at Los Arabos and Isabella de Sagua (Province of Santa Clara).

East Barnet Valley.—The U.D.C. has sanctioned the proposal of the North Metropolitan Electric Power Supply Co. to depart from the scheme comprised in their undertaking of January, 1912, subject to certain extensions being made. Providing the company agree to make such extensions, consent is to be given to the proposed mains being laid under the footway. The company have agreed to these amended conditions.

The Council has accepted the company's quotation on a contract of not less that five years for the lighting of 22 spans on Barnet Hill:—One 100-C.P. lamp per span, at £2 18s. The surveyor reported that the cost would be £64, the price including all-night lighting during the five nights extending over Barnet Fair.

Ellon.—The T.C. has decided that it cannot entertain the conditions set forth by Messrs. T. C. Smith & Co., of Aberdeen, on which the electric light could be obtained.

Enfield.—The North Metropolitan Electric Power Supply Co. have submitted to the U.D.C. a plan showing the route of trunk mains which are to be laid from Ponder's End to Edmonton, and supply cables in the Hadley Wood district. The Council has decided to raise no objection to the proposed work.

Frodsham.—The laying of mains has been commenced here by the Mersey Power Co. Most of the leading tradesmen have decided to have installations, and the question of adopting electricity for public lighting is under discussion.

Great Harwood (near Blackburn).—After interviewing Mr. S. J. Watson, of Bury, the U.D.C. has decided to approach the Accrington Corporation to ascertain the terms upon which the latter would supply electricity within the township.

Harrogate.—The Corporation is applying to the L.G.B. for sanction to the borrowing of a further sum of £2,000 for cable extensions and £500 for transformers. The recommendation of the engineer for the obtaining of a centrifugal pump and spraying nozzles for the purpose of more quickly cooling the hot water from the condenser discharge duct, was approved.

Hastings.—At the last Council meeting it was decided, on the recommendation of the Electricity Committee, to establish a uniform charge of £5 14s. each per annum for the public double-burner incandescent electric lamps.

Heywood.—The Corporation has decided to apply to the L.G.B. for sanction to borrow £11,750 for cables, buildings, &c. The expenditure is necessary in order that provision can be made to receive a "bulk supply" of electricity from the Bury Corporation, with which an agreement has been entered into.

Hornsey.—A L.G.B. inquiry was held on 5th inst. respecting the Council's proposal to borrow £540 for a sub-station site at Fortis Green.

Hull.—A special meeting of the City Council will be held next month, when Alderman Hanger will move that application be made to the B. of T. for a prov. order authorising the Corporation to supply electricity within the Parish of Sutton.

India.—We learn from India that the Government has approved of an electric supply scheme for the town of Dehra Dun, in the United Provinces. Power is to be supplied from the generating station of the Mussoorie hydro-electric scheme, which was carried out by Messrs. Bruce Peebles & Co., in 1907. As mentioned in our "Contracts Open" section, tenders are being invited locally in connection with this new scheme for the supply, delivery and erection of two 625-K.V.A. water-driven generators, also for some 50 odd miles of high and low-tension transmission lines, together with sub-station equipment and road lighting, &c.

Japan.—In view of the strong popular opinion against the project and on the advice of the authorities, the projected amalgamation of the Tokio Electric Lighting Co. and the Nippon Electric Light Co. has been abandoned.

Kirkby Lonsdale.—The U.D.C. has been approached on the E.L. question by a Bradford gentleman who proposes to form a company. The Council will go into the question fully at a future meeting.

Llanidloes.—The T.C. refused to accept a contract with the gas company for a period of five years, and has accepted a proposal submitted by Mr. Alderman Edward Hamer, in which he undertook on behalf of a company to light the public lamps in the town for the present season by electric light on the terms named by the gas company—viz., equivalent to 30s. per light for the season, with an additional £10 in lieu of paying a lamplighter.

London.—ST. PANCRAS.—Having regard to the satisfactory position in which the undertaking's reserve fund now stands (£46,865), the Finance Committee has decided to allocate to the rates a sum of £10,470, leaving the revenue account at March 31st last with a balance of £522. The Electricity Committee has had under consideration a report by the chief electrical engineer advising that an arrangement should be entered into by the Council with consumers at business premises to supply and maintain their outside electric lamps, as the gas company, by an arrangement for the fixing and maintaining of high pressure and ordinary gas lamps, are now securing customers under agreements for from three to five years. The Committee considers it important that the Council should be in a position to offer similar facilities, and has, therefore, decided to prepare a scheme.

BERMONDSEY.—The L.C.C. has sanctioned the borrowing of £8,282 for mains, repayable within 25 years and £400 for plant (switchboard panels) repayable within 15 years.

Oldham.—Mr. T. C. Ekin, one of the inspectors of the L.G.B., held an inquiry at Oldham on Wednesday last week concerning the application of the Corporation for sanction to borrow a sum of £30,000 for extensions and additions to the electricity undertaking. Mr. S. W. Newington, the electrical engineer, said that the total number of units sold in the year ended March 25th, 1913, was 6,463,416, against 5,992,476 in the preceding year. Mr. Garside said that the money was required to cover the cost of additional plant, mains, transformers, and switchboard to enable the Corporation to supply power upon the high-tension system to several mills and workshops in the district. Provisional arrangements had been entered into to supply two cotton spinning mills—the Belgrave and the Industry—and applications had also been received from the owners of the Newbreck Mill and from Messrs. Asa Lees & Co. The new plant required included two motor-generators, each of 500-KW. capacity running at 500 R.P.M., which would cost £3,000; one turbo-alternator, £4,975; one condenser; motor-driven circulating pumps, pipes, cables, switchboard, &c. Mr. Newington said that an extension of the buildings at Greenhill would be necessary to accommodate the additional plant. The new mains were estimated to cost £9,100, the average cost being 20s. per yard. The Corporation had unexercised borrowing powers on a sanction granted a year ago for about £5,000 for low-tension mains, and the Inspector observed that he thought the Board would approve of that being diverted to expenditure on high-tension mains. The borough treasurer said that the total expenditure on the undertaking was £5[illegible]3,414 to March 25th last, of which £305,645 was money borrowed on the sanction of the board, and the balance was paid out of reserve and current account.

A canvass of Royton to ascertain whether electric supply should be given there is proceeding. So far 60 or 70 premises have been secured.

Ouseburn.—The York Corporation has asked the Rural Council's consent to it supplying electricity in bulk in the rural district.

Paisley.—The T.C. Health Department is considering the advisability of purchasing a machine from the Rapid Magnetting Machine Co., Ltd., for removing iron from the refuse destructor clinker.

Perth.—The T.C. has now fixed a flat-rate of 1d. per unit for all current used for cooking and heating purposes, and a determined effort is, consequently, to be made in order to push this class of business amongst present consumers and others. With this end in view an exhibition of various appliances is to be held in the City Hall on October 8th, 9th and 10th. Cookery lectures will be given by a lady demonstrator, and a large gathering of the "Fair maids" is anticipated. Any manufacturers who would care to forward appliances for this exhibition should communicate with the burgh electrical engineer or any of the local contractors. The Corporation is to bear the cost of the Hall and give a free supply of current.

Plymouth.—A L.G.B. inquiry was held, on September 10th, into the application of the T.C. for a loan of £5,000 for plant extensions at the electricity works. There was no opposition.

Pontefract.—The Pontefract Guardians are contemplating a change from their present steam-raising appliances to electric power for driving their machinery, and have decided to obtain the loan of an electric motor, in order to test the cost of running the machinery by electricity, as compared with the cost of steam, before making a change. The Building Committee has accepted the tender of the Morley Electrical Engineering Co. for the loan of a motor.

Portrush.—A site costing £350 is being purchased by the Urban Council for the electric generating station.

Portsmouth.—The T.C. last week discussed and adopted the balance-sheet of the Electric Lighting Committee which recommended that the balance of £3,604 carried to the appropriation account be dealt with as follows:—£2,500 to the relief of rates; £500 to fire insurance account; £500 to reserve fund, and £104 carried forward. Alderman Foster said that but for the fact that coal had been much more expensive they would have finished their year's working £1,500 better off. An amendment was moved, referring back the recommendation to put £2,500 to relief of rates and instructing the Committee to reduce charges for street lighting by a similar amount, but only five members voted for it, and the report of the Committee was adopted. Alderman Foster said that they were out for business where it could be done at a profit, not for that which would show a loss.

Rawtenstall.—The Providence Baptist Chapel, Lumb, is to be lighted by electricity.

Rosario.—Engineer Ernesto Newberry, director of electrical and mechanical installations, and acting director of public lighting of the municipality of Buenos Ayres, has gone to Rosario to assist the technical committee of that municipality to adjudicate upon the tenders for the electric lighting of Rosario. —*Review of the River Plate.*

St. Albans.—The St. Albans R.D.C. has consented to the Watford U.D.C. giving a supply of electricity to the premises known as Wall Hall.

Salford.—At a meeting of the Electricity Committee last month, a report of a Special sub-Committee was approved relative to the suggested appointment of the city electrical engineer of Liverpool to advise the Committee with regard to a proposal to

modernise the generating plant at the electricity station, Frederick Road, and a resolution was adopted that the city electrical engineer of Liverpool be appointed to report upon the proposal, subject to satisfactory terms being arranged.

Shrewsbury.—The net profit for the year (after payment of sinking fund contribution and interest on loans) was £100. The capital expenditure during the year was £914, of which £401 was expended out of loans. The total outlay to date amounts to £59,289, and the outstanding debt on March 31st, 1913, was £31,655.

South Africa.—HARRISMITH, O.F.S.—Mr. John Roberts, the Durban borough electrical engineer, who has been investigating the possibilities of the generation of electricity for the lighting of Harrismith from the water supply on the Platburg Mountain, overlooking the town, has just presented an exhaustive report thereon. He adversely criticises the scheme in view of the limitation of the water which, while sufficient for the present demands, does not give sufficient margin for much extension in the future, and, as an alternative, he suggests the installation of a gas-engine plant which, at the last meeting of the Town Council, Mr. Roberts was asked to make a full report on. Mr. Roberts suggests the desirability, when calling for tenders, of allowing tenderers to submit alternative propositions for Diesel engines using crude oil.

Stanley (Co. Durham).—After receipt of a letter from the B. of T. respecting the electric lighting order, which was granted 11 years ago, and has not been acted upon, the U.D.C. has asked the Board to cancel the order.

Swanage.—The Electric Lighting Co. has commenced the laying of mains in the town.

Swansea.—The borough electrical engineer has been instructed to report upon an application received for consent to erect poles to take electric power from the Rhondda Valley to Penllwyngwent Colliery. Sanction has been received from the L.G.B. to the borrowing of £40,000 for electricity purposes. The chairman and vice-chairman of the Electric Lighting Committee, together with the electrical engineer, have been authorised to purchase four sets of converting machinery and accessories for substations. Plans and specifications are being prepared for the erection of a sub-station at the Uplands. Main extensions are to be carried out in various parts of the districts. A temporary supply of energy is to be laid on to the Council's new training college now in course of erection. Arrangements are being made with the Electric and Ordnance Accessories Co., Ltd., for a continuation on the same terms, for a period of one or two years, of their contract for the supply of electric motors. Tenders are invited for an annual or biennial supply of starting switches.

Swinford.—The L.G.B. has approved of the plans and specifications for lighting the workhouse electrically.

Swinton and Pendlebury.—The D.C. has still under consideration what system to adopt in the electric lighting of the tramway route. The experiment along Manchester Road is to continue, and lamps of different illuminating powers are to be tried before a final decision is arrived at.

Truro.—The T.C. has decided to ascertain upon what terms the Cornwall Electric Power Co., of Hayle, will supply electricity in bulk. A site has been provisionally selected for the erection of a generating station at a cost of £600.

Walsall.—At the meeting of the Council on Monday, the Electricity Committee reported that a rotary transformer at the Butts Road sub-station had been seriously damaged. The initial cause of the difficulty, the Committee stated, was a fracture in the low-tension shunt circuit of the machine, and a contributory cause was the failure of the low-tension switch to clear the machine from the low-tension mains when it operated automatically on the reverse cut-out, the consequence being that the transformer raced away and the armature and field coils were wrecked. Alternative estimates obtained from the engineer show that the net cost of repairing the old machine (which is a 100-KW. continuous-current transformer, erected in 1903 at a cost of £1,126) would be £387, as against a net cost of £800 for a 250-KW. A.C. rotary, and of about £600 for a 100-KW. A.C. rotary. Having regard to the fact that the repair of the old D.C. transformer would only give 100 KW. capacity of what is practically an obsolete type of plant, whereas for an additional expenditure of £250 an additional capacity of 150 KW. of the most modern type of plant could be obtained, the Committee has accepted the recommendation of the engineer that the old transformer be not repaired, and has deferred the question of putting down an additional A.C. rotary pending the consideration of the proposed extension scheme.

Warrington.—The Electricity and Tramways Committee has authorised the engineer to employ Mr. Percy Silcock to prepare a plan and estimate for the extension of the buildings at the electricity station.

Whitstable.—The U.D.C. on September 9th approved of a draft agreement with the Whitstable Electric Supply Co., Ltd., for public lighting, and consented to the company's engineer consulting Messrs. Strachan & Weekes as to the advisability of the Council's adopting electric power for sewage pumping purposes.

Wishaw.—The annual report of the Electric Lighting Department shows a net profit of £53. Last year there was a deficit.

Yarmouth.—The L.G.B. has sanctioned the borrowing of the following amounts required in connection with the electricity undertaking: £3,650 for generating plant, £820 for new switchboard, £150 for travelling crane, £2,000 for prospective expenditure on house services, £200 for cooling tower, and £1,635 for public lighting. The Board, in arriving at the sum of £820 for the new switchboard, made a reduction of £180 in respect of the debt outstanding on the existing switchboard, which was to be superseded; and the loan was sanctioned on the condition that the extra cost of the new board would be defrayed to the extent of £180 out of current income. As regards the loan for public lighting, the Board stated that it was against its practice to sanction a loan for prospective expenditure on that account. Tenders are required for the new generating plant above mentioned.

Yeovil.—Mr. E. W. Pelter, of Yeovil, has informed the T.C. that he intends applying to the B. of T. for a prov. order for electric lighting. When the matter came before the Corporation on September 11th, the Mayor said he did not think they should object to the application. Some years ago the Council obtained its own order, the object being to keep away competition from the gas works, but that order had been revoked. The Council decided to acknowledge the receipt of the notification.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—At a meeting of the Corporation Tramways Committee, Mr. Pilcher, the general manager, reported regarding the requirement of six additional top-covered cars. Authority was given to have the Brill trucks ordered, and to accept tenders for the electrical equipment. The Committee resolved to recommend that, with the view of carrying out the extension scheme which the Council has already approved, notice be given of its intention to apply in November for a provisional order. Under this order power will be sought to construct lines along Midstocket Road and in Torry, to run a railless trolley system in certain districts, and to run motor-'buses within the city boundary. It is proposed that the surplus profits of the undertaking be applied either for relief of rates, for public improvements, or to the common good. Borrowing powers to the extent of £50,000 are also to be sought.

Ayr.—Mr. W. Grant, general manager of the Corporation tramways, in his annual report, states that the total revenue for the year amounted to £16,295, being the highest in the history of the department. The passengers carried during the year numbered 3,880,850, an increase of 3·62 per cent. over the number carried in the previous year. Halfpenny fares represented 55·33 per cent. of the passengers and 28·63 per cent. of the receipts; 1d. fares, 17·86 and 18·49; and 2d. fares, 12·29 and 25·46 respectively. The net balance from the year's working amounted to £3,378, of which £2,040 was carried to the depreciation and renewals fund, and £1,337 transferred to the burgh general assessments. The depreciation and renewals fund now amounts to £9,918, while there is also a reserve fund of £5,000.

Belfast.—A provincial newspaper states that the Irish Local Government Board auditor has surcharged as illegal the payment of £2,800 made in May, 1912, to the employés of the tramway department of the Belfast Corporation as bonus for long service, good conduct, &c. The surcharge has been made on the three members of the Corporation—an alderman and two councillors—who by their signatures authorised the payment. The effect of this surcharge, it is understood, will be that practically every employé in the Corporation tramway service in receipt of a weekly wage will have his allowance reduced by an average of about 1s. 9d. a week. The Corporation holds that this is a perfectly legitimate charge, and is, in fact, allowed in some Government departments, and the auditor's action will be disputed in the Irish Courts.

Birmingham.—The B. of T. has confirmed the Birmingham Corporation (Quinton) Light Railway Order, 1913, authorising the construction of a light railway in the City and County of Birmingham, and in the Parish of Warley, in the Urban District of Oldbury.

Bradford.—The fifteenth annual report of the Corporation Electric Tramways undertaking, dated to the end of March last, was issued on Wednesday last. The manager, Mr. C. J. Spencer, describes the situation as being at the "half-way house," inasmuch as the loans for tramway purposes were granted generally for 30 years, and nearly half the capital borrowed for these purposes has been repaid. In 1899 there were 5 miles of electric Corporation tramway in the city, 1,542,000 passengers were carried, and the takings were £8,870. In 1900, on the same 5 miles, 4,120,000 passengers contributed an income of £20,109. In 1912 there were 56 miles, and £289,335 receipts; in 1913 57 miles, 62,005,976 passengers, and £299,102 receipts. The years 1912 and 1913 include 1¼ miles railless electric traction. In 1898, the year in which the tramways were opened, the average distance a passenger could travel was 1·05 miles; to-day it is 1·6 miles. Mr. Spencer expresses great satisfaction with the continued increase of revenue, notwithstanding the heavy decrease in fares for early morning traffic. The railless department shows a loss on the face of the accounts, but, says Mr. Spencer, it is impossible to say

whether that is a real loss or not. The vehicles are of the pioneer type, and are to be replaced by more modern cars. The report refers to the rather extraordinary operating difficulties which exist in the city, by reason of the steep gradients, heavy wear and tear, and the low density of population per route-mile, owing to the widely-spread area of the city, and says that in view of these difficulties the Corporation may be congratulated upon being able to pay good wages, meet all dues and demands, contribute annually a substantial amount to the relief of rates, and possess a reserve and renewals fund amounting to about £90,000.

Dover.—At a recent meeting of the Electricity Committee, reference was made to the decreased consumption of energy (25 per cent.) by the electric tramcars, due largely to the use of meters. The chairman said that they ought to have had the meters years ago.

Dunfermline.—Correspondence which has passed between the Town Council and the proprietors of the Pitreavie estate indicates that a tramway system for Rosyth is being considered.

Greenock.—The question of the municipalisation of the tramways is being discussed. The line between Gourock and Port Glasgow is held on lease by a company. Under the lease there is a break in 1914, so that next year the Corporation will have the power to take over the Greenock portion, a length of four miles, as a going concern.

Japan.—The Awa Electric Light Railway Co. has secured a concession from the Japanese Government to construct and work a light electric railway between Horie and Itanishi, in the prefecture of Tokushima.

London.—Traffic at Golder's Green was held up late on Monday night owing to the falling of an overhead wire. The trolley of a tramcar in Finchley Road began to burn, and one side of the tramcar caught fire. The flames were quickly put out, and no one was injured. Some distance up the road a section box caught fire, and several wires were burnt through.

The L. & S.-W. Railway Co. has commenced the work of the electrification of the Kingston loop, which it promised to put in hand first, and on the 10th inst. a gang of men was employed at Teddington in placing the rails in readiness for the fitters.

Mumbles.—The *Western Mail* states that the chairman of the Swansea Tramways Co. and its allied concerns, the Mumbles Railway and Pier (Mr. Tegetmeier), visited Swansea, in company with Mr. A. M. Little, consulting engineer, last week, and, with the local manager (Mr. David James), inquired into the possibility of installing an electric traction system on the Swansea and Mumbles Railway. A proposal is now under serious consideration which will probably render possible the provision of a 10-minute service of trains, capable of carrying between 400 and 500 passengers. The line would have to be doubled, or passing-places provided, and an expenditure of £40,000 to £50,000 would be necessary.

Worsley.—The clerk to the D.C. has been instructed to write to the B. of T. informing it that representations had on several recent occasions been made to the Council respecting the condition of the cars on the Worsley section of the South Lancashire Tramway Co.'s system, and requesting that an inspection of the same be made as early as convenient.

TELEGRAPH and TELEPHONE NOTES.

Bahamas.—The radio-telegraphic station at Fort Charlotte, Nassau, has been formally inaugurated. The system adopted is the quenched-spark system of the Anglo-French Co.

Japan.—Negotiations are at present in hand between the Japanese Government and the Great Northern Telegraph Co. with reference to the purchase by the former of the telegraph cable between Nagasaki and Shanghai.

Telephony in Mining.—A demonstration of the Reineke wireless telephone adapted for use in mines was recently given at the Annandale Pit, Kilmarnock, belonging to the Carrington and Auchlochan Coal Co. The tramway lines in the mine were utilised for connection, and conversations were carried on from the pit bottom to the extremity of the workings, a distance of 400 yards. In the absence of rails the system can be worked through solid coal. It was stated that with a portable apparatus in case of an accident, when ordinary telephone wires would be broken, it would be possible by this wireless system to converse with entombed miners through a solid fall. The officials of Dinnington Main Colliery, Yorkshire, where the system has had a six months' test, are in the habit of speaking from the pit-head or the pit-bottom to an operator in the cage while in motion. They have also, it is stated, spoken with success through a mile of solid coal.

The Goldschmidt System.—It is rumoured that the British Marconi Co. is negotiating for the purchase of the entire patent rights of Prof. Goldschmidt, which, according to the *Frankfurter Zeitung*, formerly belonged to the High-Frequency Co., of Berlin, and were sold last year to the Cie. Universelle de Télégraphie et de Téléphonie sans Fil, of Paris, a company with a paid-up capital of £100,000.

Wireless Strike.—The strike of Italian operators of the Marconi wireless installations on board steamers at Genoa was promptly settled last week, and the men returned to work.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Perth.—November 12th. For the P.M.G. Lamp signalling trunk line switchboard, of five sections, &c.

New South Wales.—October 15th. The Government Railways invite tenders for the supply of 13 D.C. motors, to specification No. 412. Specifications are obtainable at the Electrical Engineer's Office, 61, Hunter Street, Sydney (price 2s. 6d. each).

Sydney.—October 15th. For the P.M.G.; measuring instruments, telephone parts and switchboard parts. Particulars from the Commonwealth Office, 72, Victoria Street, S.W.

Victoria.—November 12th. For the Victorian Railways; flame arc lamps.

October 14th.—For the P.M.G. A common-battery multiple switchboard.

November 4th.—For the P.M.G. Eight automatic telephone switchboards.

November 12th.—Victoria Railway Department. State coal mines, Wonthaggi. The time for tenders for haulage engine and electrical equipment has been extended to November 12th, and a copy of specification may be seen in London (C.I. Department, Board of Trade).

November 15th.—Melbourne Suburban Railways. Overhead electrical equipment of permanent way and overhead transmission mains. See "Official Notices" September 12th.

Melbourne.—October 1st. Lead-covered cable, for the City Council. See "Official Notices" to-day.

October 7th.—Six 60-K.V.A. and one 30-K.V.A. single-phase transformers, for the City Council. See "Official Notices" to-day.

October 7th.—33,300 carbon-filament lamps, for the City Council. See "Official Notices" to-day.

Melbourne Railways.—October 15th. 20,000-volt H.T. switchgear, L.T. switchgear and accessories for the power stations and sub-stations. See "Official Notices" to-day.

South Australia.—Adelaide.—November 12th. Postmaster-General's Department. Lamp-signalling trunk line switchboard. See "Official Notices" September 12th.

Belgium.—October 18th. The Belgian Post and Telegraph authorities in Brussels (Salle de la Madeleine) are inviting tenders for the supply and laying of a quantity of telephone cable in the Malines district.

Burnley.—September 22nd. The Guardians of the Burnley Union invite half-yearly tenders for the supply of electrical requirements.

Canterbury.—September 29th. Supply and fitting of electric motor to deep well pump, for the B. of G. Mr. C. A. Blascheck, Electricity Works, Canterbury.

Constantinople.—The Turkish Government having decided to introduce electric lighting into the whole of the islands in the Sea of Marmora, invite international tenders. Particulars from the Ministry for Trade and Public Works.

Dublin.—September 19th. Electric lighting and heating works at the Crooksling Sanatorium for the Dublin Joint Hospital Board. Mr. T. F. McNamara, architect, 192, Great Brunswick Street, Dublin.

Egypt.—October 31st. Ministry of the Interior. Tenders for the installation of the electric light at Damanhur.—*African Engineering.*

France.—September 24th and 28th. The French Post and Telegraph authorities in Paris (103, Rue de Grenelle) are inviting tenders, until the 24th inst., for nine lots of lead-covered telephone cable, with 14 and 28 pairs of conductors; and, until the 28th inst., for five lots of gutta-percha and cotton-covered copper wire. According to another source of information, the dates are October 7th and 8th respectively, and 11 lots of telephone accessories are also required.

Germany.—October 15th. The municipal authorities of Frankfort-am-Main are inviting tenders for four electrically-operated travelling cranes.

Greece.—September 30th. The Harbour Authorities at the Piræus are inviting tenders for the supply and erection of two electrically-operated cranes, one of 10 tons and one of 6 tons capacity.

Halifax.—September 23rd. Electrical fittings for the B. of G. for six months. Mr. A. T. Longbotham, clerk, 4, Carlton Street.

Holland.—September 24th. Tenders are being invited by the Dutch Post and Telegraph authorities at the Hague for the laying of some telegraph cables across the river Yssel at Zutphen.

Hoylake and West Kirby.—Corporation. Steam and exhaust piping. See "Official Notices" September 12th.

Ilkley.—October 6th. (Sec. 1) Prime-movers; (2) station equipment; (3) cables and distribution; (4) overhead travelling crane. See "Official Notices" September 12th.

India.—September 19th. *Indian Engineering* for August 23rd contains official announcements to the effect that the following contracts have been open till to-day (September 19th):—

Dehra Dun Municipal Board.—H.T. transmission lines; sub-station buildings and equipment; L.T. distribution system and road lighting; and sundries.

Mussoorie Municipal Board.—Two 625-K.V.A. water-driven alternators, complete with direct-coupled exciters, regulators, lightning arrester equipment, &c.

Both notices are signed by W. Bell, electrical engineer to the Mussoorie-Dehra hydro-electric scheme.

Keighley.—October 1st. 6,600-volt 3-phase A.C. transmission line (two miles) for the Corporation. See "Official Notices" to-day.

Leicester.—September 30th. (*a*) One high-pressure steam turbine, direct-coupled to one 3,000-KW. three-phase alternator, together with condensing plant, high and low-tension switchboards, rotary converters, &c.; (*b*) two water-tube boilers, together with fuel economiser, and the necessary steam, feed, blow-off and drain pipes, &c. See "Official Notices" September 5th.

London.—Hammersmith.—September 24th. Borough Council. Underground cables, and sub-station switchgear. See "Official Notices" August 29th.

Hammersmith.—September 24th. Borough Council. One 125-H.P. alternating-current motor. See "Official Notices" September 12th.

Bermondsey.—October 23rd. Water softener and purifying plant at the Infirmary, Lower Road, Rotherhithe, S.E. Mr. E. Pitts Fenton, Clerk.

New Zealand.—October 31st. Telephone instruments and accessories for Lake Coleridge power scheme. Specification may be seen at Board of Trade (C.I. Dept.) in London.

November 12th. Dunedin City Council. Supply of meters, demand indicators, insulated and bare wire, for two years. Specifications from Electrical Engineer, Dunedin.

December 11th.—Switchboard and accessories for Wellington Corporation E.L. Dept. Specification may be seen at Board of Trade (C.I. Dept.) in London.

Tenders are also asked for the supply of two A.C. pressure regulators for 3,000 and 400 volts. British manufacturers can obtain particulars at the B. of T. Commercial Intelligence Department.

Salford.—September 29th. Compound air compressor, for the electricity department. Specifications, &c., from Borough Electrical Engineer, Frederick Road, Pendleton.

September 29th.—Rotary converters for the Corporation. See "Official Notices" to-day.

Saxmundham (Suffolk).—October 2nd. Sewerage and sewage disposal works, with pumping and electrical plant, dynamos, motors, cables, switches, &c., for the R.D.C. Mr. P. F. Mackenzie Richards, engineer, 53, Victoria Street, Westminster, London. (Returnable deposit of £5 5s.)

Spain.—October 6th. The municipal authorities of Manzanares (province of Ciudad Real) are inviting tenders for the concession for the electric lighting of the town during a period of 25 years.

Madrid.—October 15th. Concession for the public lighting of Madrid by gas, electricity, or gas and electricity. Particulars of the Ayuntamiento de Madrid.

The municipal authorities of Valdaracete (province of Madrid) have just invited tenders for the concession for the electric lighting of the town during a period of ten years.

Uganda.—December 31st. Electric light and power supply for 10 years at Kampala and district, including 300 32-C.P. street lamps and 200 16-C.P. lamps in Government quarters. Uganda Public Works Department, Entebbe.—*Brit. S.A. Export Gazette.*

Walthamstow.—October 8th. L.T. feeder cable for the Electricity Department. See "Official Notices" to-day.

Worthing.—September 29th. Corporation. Supply, delivery and erection of Diesel engine and D.C. generator. See "Official Notices" September 12th.

CLOSED.

Australasia.—According to the *Australian Record*, the following tenders have been accepted:—

Perth.—

20 miles wire, tinned copper, No. 20 L.S.W.G., rubber-insulated, copper-covered and braided, £3 19s. per mile.—W. T. Henley's Co., Ltd.

Tasmania.—

8½ miles lead-covered cable, £1,820.—B.I. and Helsby Cables, Ltd.
25 detectors, £71 17s. 6d.—British General Electric Co., Ltd.
5 miles wire, twisted pair, tinned annealed copper, £65 5s.; 20 miles wire, tinned copper, vulcanised india-rubber, £128.—Ford, Rhodes & Ford.
5 miles wire, twisted pair, outside distributing, £95.—Zwicker & Co.
5 miles cable, two-wire V.I.R., copper conductors, £122 10s.—Noyes Bros (Melbourne) Pty., Ltd.
400 protectors, £80.—British General Electric Co, Ltd.
150 registers, electrical, £132 10s.—J. Bartram & Sons Pty., Ltd.
10,000 copper tapes, £20 2s. 6d.; 10 tons wire, galvanised iron, £118 15s.
5 tons wire, bronze, £439 13s.—F. Vanderkelen & Co.

A contract for converting a lift from hydraulic to electric working, for the Public Works Department at Sydney, has been placed with Messrs. Standard Waygood, Ltd., at £770.

Belgium.—Nine concerns—five German, one Swiss and three Belgian—submitted tenders last week to the municipal authorities of Liége for the supply and installation of a 4,000-KW. steam turbine and alternator. The lowest offer was that of the Société A.E.G. Union Electrique, of Brussels, who quoted £6,760 and £11,120, according to the design selected.

Bexhill.—The Council has accepted the tender of Messrs. Myers, Rose & Co., Ltd., for 1,000 tons of Shipley peas for the electricity works, at 19s. 1d. per ton.

Bexley.—The U.D.C., on September 10th, accepted the quotation of the Hart Accumulator Co., Ltd., for renewing and enlarging the battery, at £500.

Blackpool.—Mr. R. Barron, electrician, of Fleetwood, has obtained the contract for installing electric light at the new extension at Cleveley's Hydro, and for Arnold House School, South Shore, Blackpool.

Bournemouth.—The Council has accepted the tender of Messrs. W. Griffith & Co. for tramways construction works.

Brighton.—The B. of G. has accepted the tender of Mr. H. J. Galliers, of Brighton, for electrical fittings, at £76.

Canada.—A Canadian correspondent writes that the contract for the conduit system at Hamilton, Ont., has been provisionally placed with Mr. G. M. Gest, Montreal, at $177,822 for laying conduit. This does not include cables, which will be looked after by the various concerns interested. The other tenders were as under:—

F. T. Ley & Co., Springfield, Mass., U.S.A., $180,371.
J. W. Turner Improvement Co., Des Moines, Iowa, U.S.A., $197,366.
H. E. Fox, New York, U.S.A., $292,806.

All four firms are really American, as Mr. G. M. Gest was only in New York until it became necessary to open a Montreal office to look after the conduit contract for that city which they also secured. All rough labour is to be local. The conduit will actually be laid along 8½ miles of street, covering every street in the centre ½-mile square, and the two main streets which run diagonally through the city.

The *Canadian Engineer* reports the placing of the following contracts:—

Carlyle, Sask.—

Return tubular boilers, stack, steam piping.—Waterous Engine Works Co.
High speed vertical engine.—Goldie & McCulloch Co.
Alternator and switchboard (for Swedish generator).—General Supplies, Ltd., Calgary.
Copper wire.—E. F. Phillips Electric Co., Montreal.
Transformers.—Canadian Maloney Electric Co.
Line erection.—E. Smith Electric Co., Melville, Sask.
John Galt Engineering Co., Winnipeg, are the consulting engineers.

Winnipeg.—

The Board of Control has awarded the Canadian Westinghouse Co. the contract for supplying three generators for the municipal power house at Point du Bois. The contract price is $103,800. There were five other tenders submitted.

Ottawa.

The Electrical Commission has awarded the Imperial Wire and Cable Co., Montreal, the contract for supplying wire cable required for the conduit work.

Ilford.—The T.C. is purchasing from the British Insulated and Helsby Cables, Ltd., a mile of tramway trolley wire, at $9\frac{19}{20}$d. per lb., less 2½ per cent. discount. The tender of the Edison Accumulators has been accepted, at £689 10s., for the supply of a motor tower wagon.

Italy.—Messrs. Langen & Wolf, of Milan, have secured a contract from the municipal authorities of Cerignola for a 200-H.P. Diesel heavy-oil engine for the central electric lighting station, at £1,780.

Lincoln.—The T.C. has sealed the following contracts:—

Willans & Robinson, Ltd.—Turbo-alternator, &c.
Howden Boiler Co.—Water-tube boiler, &c.
Geo. Robson & Co.—Coal-elevating and conveying plant.
Thornhill Bros.—Extensions to the electricity works.

Malvern.—The U.D.C. has accepted the tender of Messrs. M. Wilesmith & Son for a year's supply of coal to the electricity works.

Paraguay.—The Paraguay Government has authorised the Minister of Interior to sign a contract with Messrs. Siemens-Schuckert for the installation of ten wireless telegraphy stations.—*Review of the River Plate.*

Simla.—*Indian Engineering* states that the Simla Municipality has accepted Messrs. Siemens Bros.' tender for appliances for lighting the bazaar with electricity.

Southampton.—The T.C. has accepted the tender of Messrs. Briggs, Jones & Gibson, Ltd., for 180 pairs of trousers for tramway motormen and conductors, at 13s. 6d. per pair.

Sunderland.—The T.C. on 10th inst. accepted the following tenders :—

B.I. and Helsby Cables, Ltd.—Cable.
Stave'ey Coal and Iron Co.—Cast iron piping.
Alley & McLellan.—Non-return valve.
Phœnix Dynamo Co.—Rewinding a ternator.

Walsall.—The Corporation Electricity Committee has accepted estimates for the purchase of a 250-KW. A.C. rotary and a 100-KW. A.C. rotary, at £800 and £600 respectively.

Yarmouth.—The tender of the British Westinghouse Electric and Manufacturing Co., Ltd., has been accepted by the T.C. for 24 tramcar gear wheels, at £2 13s. 6d. each.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Saturday, Sept. 13th. At 10.30 a.m. Visit to the works of Messrs. R. Waygood & Co., Ltd., Falmouth Road, London, S.E.

Salford Technical and Engineering Association.—Saturday, September 20th. At 7 p.m. Lecture on "Grinding Wheels, Grinding Machines, Grinding," by K. D. Morgan.

Municipal Tramways Association.—September 23rd to 26th. At Sheffield. Annual Conference.

NOTES.

National Chamber of Trade.—The autumn meeting of the Executive Council of the National Chamber of Trade is to be held on Thursday, the 25th inst., at the Leeds Town Hall. Some interesting resolutions are upon the agenda for consideration. In regard to the Insurance Act, the resolutions contain a protest against the obligation upon employers to produce a private wages-book to the Inspectors—the ground of objection being that the information in such books is of a private and confidential nature—and the Insurance Commissioners are urged to be content with the production of the employés' cards, if these are properly stamped. There is also an expression of regret that there is no provision for adequate representation of employers on the Local Committees, and that amendments designed to prevent employés being able to claim full wages during sickness, in addition to sick benefit, were not favourably considered by the Government. Other resolutions favour all general holidays being at fixed, instead of movable dates, a Registration of Firms Bill, the appointment of a Select Committee to consider telephone questions, a Sunday Trading Bill, a Central Waterways Board, reform in the incidence of local rating and taxation, reforms in railway law, the Daylight Saving Bill, a Bill making highways a national charge, and providing for a tonnage rate on motor vehicles used for merchandise, and a general arrangement for wholesale traders to pay carriage on goods in the first instance.

Olympic Fund.—Mr. Richard Burbidge, managing director of Harrod's, Ltd., has offered to subscribe £100 a year for four years, from 1913 to 1916 inclusive, towards the Olympic Fund, on condition that not fewer than 10 other firms in the United Kingdom do the same.

Foreign Trade in August.—The official trade returns for the month of August show an advance of £322,008 in exports and a decrease of £3,683,782 in imports, as compared with the corresponding month of 1912. The following figures relate to the electrical and machinery trades :—

	Month of August.	*Inc. or dec.*
IMPORTS.		
Electrical goods and apparatus, excluding machinery and uninsulated wire	£120,108	+ £16,781
Machinery	530,652	+ 5,021
EXPORTS.		
Electrical goods and apparatus, excluding machinery and uninsulated wire	285,191	− 67,477
Machinery	2,885,774	+ 151,746

Fatalities.—ABERDEEN.—An electrical engine attendant at the Central Post Office, while attempting to adjust a belt on a pulley while the engine was in motion, was caught by the belt and sustained fatal injuries.

STIRLINGSHIRE.—A pit fireman, residing at Dennyloanhead, was electrically killed in Broomrig No. 2 Pit of the Bankrock Coal Co., Ltd., while helping to extend the cable of an electric coal-cutting machine.

At the bulk supply station at Dramburg, Germany, an engineer, named Bergmann, while seeking to remedy a disturbance in the service, received the full force of the high-pressure current with fatal effect. His body was burnt beyond recognition.

Educational Notes. — MUNICIPAL SCHOOL OF TECHNOLOGY, MANCHESTER.—We have received a set of copies of the Departmental Prospectuses of the Part-time (evening and Apprentices' Day) courses to be held at the School of Technology during the next Session, and we are informed that for the first time everyone of the 4,300 Part-time students in the school will be supplied free of charge with full particulars and syllabuses of the classes he is attending. The number of evening students has reached the limit of the accommodation provided by the present building, but the demand for advanced courses continue to increase. It has, therefore, been found necessary to abandon some of the more elementary classes, and to raise the fees in other cases. A special feature is the large proportion which the advanced work bears to the whole. This evening work in the case of a number of courses is of the same standard as that given to third-year students reading for an honours degree in a British University. There is also provided a considerable number of classes for students who have been engaged in industrial occupations since obtaining their degrees, and who wish to keep in touch with the recent developments of theory and practice with which their daily work has made them familiar. The prospectuses are admirably produced, and their contents are well calculated to whet the appetite of students for the acquisition of learning their craft. Prof. Miles Walker is the head of the department of electrical engineering.

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.—Particulars appear in our advertisement pages of a special advanced course of instruction commencing next month by Dr. S. P. Smith on "The Principles, Design and Manufacture of Electro-Magnetic Machinery and Transformers, including electro-magnetic machinery." Series I: Synchronous and Induction Machines.

ROYAL COLLEGE OF SCIENCE FOR IRELAND.—Particulars of courses of instruction and professors, &c., are announced in our advertisement pages to-day.

UNIVERSITY ENGINEERING COLLEGE.—We have received Prospectus No. 7 from this Institution, which carries on tuition by correspondence, the principal being Mr. John G. Davis, B.Sc.Eng. (Hons.), London. A wide choice of courses is offered, ranging from work for beginners to advanced work for specialists, and special courses or contributions are arranged to suit individual requirements. A special feature is made of coaching for the entrance examinations of the various Institutions, amongst which must now be included the Electrical and Mechanical Engineers, and for engineering degrees. From the copies of testimonials accompanying the prospectus, it seems that the writers have had every reason to be gratified with the assistance given them by the College.

Municipal Tramways Association.—Next week the annual Conference will be held at Sheffield, commencing on Wednesday and ending on Friday. Full particulars of the agenda were given in our last issue.

Electric Supply Cricket League.—Below are given particulars of the points scored during last season by the clubs affiliated to this League, from which it will be observed that the Chelsea Electricity C.C. are the winners of the cup this year :—

Chelsea Electricity C.C.	10 points.
Kensington and Knightsbridge Electric C.C....	9 ,,
St. Pancras Electric C.C.	5 ,,
St. James's Electric C.C....	0 ,,

Mr. A. W. Seabright, the hon. secretary and treasurer, of 19, Cadogan Gardens, S.W., will be pleased to furnish Electricity Supply Cricket Clubs with any information they may desire to have in connection with the League.

Another Moulders' Strike.—The *Financial Times* states that upwards of 1,000 journeymen moulders and 500 apprentices are affected by a strike of moulders, which began in Sheffield on Saturday. All the big steelworks in Sheffield are concerned, and it is feared the dispute may be a protracted one and within a short time throw out many thousands. The men are striking against the employment of non-union labour at Messrs. Edgar Allen & Co., Ltd., Tinsley. A short time ago they came out on strike for three weeks without notice, but the Union executive refused to sanction it and they went back and gave proper notice.

Fall of a Steel Chimney.—At Workington Iron and Steel Works, on Tuesday, a steel chimney shaft, 180 ft. high, fell upon a rolling-mill shed, killing five men and injuring others. It is said that the fall was due to a gas explosion in the flues underneath the chimney. The exhaust main of a new turbo-generator recently installed was cut in two.

Annual Sports.—The Ordnance Athletic Club (The Electric and Ordnance Accessories Co., Ltd, Vickers, Ltd.), held their third Annual Sports meeting on their ground at Witton on Saturday, 13th inst. The full programme of 24 events (all closed to members) was carried through with great success. Two special prizes of considerable value were given by the superintendent of the works, Mr. W. L. Topple. The other prizes were handsome and numerous and were much appreciated by winners to whom they were presented by Mrs. Topple. The weather was all that could be desired, and a delightful afternoon was enjoyed by a company of 600 members and friends.

Rifle Match.—On the 6th inst., the Siemens Dalston Works Miniature Rifle Club met the Western Electric Co.'s Rifle Club on their open-air range at Plumstead, the result being a win for the Siemens team. The average score of Siemens team was 89 5, the total score being 537 out of a possible 600

Association of Electrical (Station) Engineers.—A meeting of the Grimsby branch was held on Friday, September 12th (Mr. A. Nuttall in the chair). It was reported by the hon. secretary (Mr. W. M. Fowler) that the grievances of some of the branch members with regard to number of working hours, &c., had been remedied through representations made by the Association, and the meeting expressed approval with the way in which the matter had been dealt with. A paper was read by Mr. P. B. Roberts, entitled "Running a Steam Turbine." A very interesting discussion followed. The Grimsby Corporation is extending its plant by adding a steam turbine, and Mr. Roberts's paper being purely practical, it was specially appreciated by members of the Corporation staff. The vote of thanks was passed to Mr. Roberts for his paper, and the next meeting was arranged for October 6th. Now that the holiday season is nearly at an end, and shift arrangements are normal, a number of meetings are being arranged at all important centres, details of which will be advertised. The principal object of these meetings will be to discuss a "bold progressive policy" for the Association.

Gas Fires on Trains.—The following timely letter appeared in the *Westminster Gazette* of Wednesday :—

Sir,—Whether the recent conflagration of the telescoped coaches during the Aisgill disaster will result in the substitution of electricity for gas remains to be seen. That gas-tanks are highly undesirable was again made apparent yesterday at Victoria Station on a L.B. and S.C.R. Co.'s train. The accident has not found its way into the papers, doubtless because no loss of life followed, but as I was an eye-witness I will describe it. A train ready to start, and full of passengers, was standing at No. 1 platform. Suddenly the gas-tank under the last coach burst into flames; immediately the tube to the main also caught fire. The noise of the flaring gas was tremendous, and the flames speedily set fire to the step of the coach. Guards rushed shrieking down the platform calling to the passengers sitting in the train to get out. Others arrived with extinguishers—three of these were brought to bear on the burning woodwork, which was put out, but the extinguishers failed to extinguish the burning flare from the gas-tank. Then the train was moved out, still burning, some few yards, and a workman put out the flames by turning the key of the tank. The moral is that had the train been in motion, instead of standing in the station, an accident would have been inevitable.

The ugliest part of the story is that I heard an official say to another: "Keep it dark; if the papers get it there'll be trouble."—I am, Sir, yours faithfully, RICHARD R. KNOWLES.

September 16th.

This communication affords a fitting comment on the recent statements of railway officials.

We may supplement the remarks in our leading columns regarding the use of electric lighting on Continental trains by mentioning that one firm alone—that of Brown, Boveri—has supplied 1,060 equipments to the Paris-Orleans Railway; the same system is also used almost exclusively on the Swiss Federal Railways, and is largely employed on the Austrian and Russian State Railways.

International Electrotechnical Commission.—The second plenary meeting was held in Berlin from September 1st to 6th last. It was attended by some 70 delegates from 24 nations, five of which represented Spanish-speaking countries. Amongst several official Government delegates were those of Canada, India and Great Britain.

In the regrettable absence of Prof. Dr. E. Budde, President of the Commission, Dr. E. Warburg, President of the Physikalische Technische Reichsanstalt, presided at the official opening. On behalf of the German Government, an address of welcome was given by Dr. Lewald, Director in the Ministry of Interior. In conformity with the custom of the Commission, a chairman was elected to preside over the unofficial meetings at which the work of the various Special Committees, appointed at Turin, was considered in detail. Mr. C. O. Mailloux, President of the American Institute of Electrical Engineers, was unanimously chosen for this post, than whom no fitter member of the Commission could be found, more especially because of his wonderful linguistic abilities.

The Special Committees were presided over by Dr. S. P. Thompson (Nomenclature), Dr. K. Strekker (Symbols), Mr. Huber-Stockar (Rating), and Dr. Zoelly (Prime Movers).

As regards nomenclature, a list of some 80 words and definitions was adopted. This does not appear much of an accomplishment, but it nevertheless represents much conscientious work on the part of the members. The Commission has decided to add German and Spanish equivalent terms with their definitions to this list.

Dr. Warburg presented, in person, a report on the question of an international standard for copper, the recommendations in the report having been drawn up by Dr. R. T. Glazebrook, in consultation with the National Laboratories of America, France and Germany. The adoption of this report will have the result that all future tables for copper will be calculated on an identical basis.

A number of definitions dealing with the terminology of water-power plants in conjunction with electrical works were adopted.

A list of 36 symbols was adopted, together with a number of guiding rules relating to symbols generally.

The name of "Siemens" instead of the "mho" is to be put before the San Francisco Congress.

The rating of electrical machinery gave rise to a prolonged and interesting discussion. It will be remembered that a Special Committee to study the subject was appointed at Turin in 1911, and that the Committee has met in Paris and Zürich. At Zürich certain limiting temperatures for modern insulating materials were put forward, and, broadly speaking, these have been adhered to. Much discussion centred round the question of the cooling air temperature. The distinction between the ideal rating which is useful for the purposes of comparison, and the available output which is dependent on the geographical position, came out most clearly in the debate. The majority of delegates were in favour of 40° C. as the limit of the cooling air temperature; three delegates, however, preferred 35° C. As it was not possible to arrive at a decision on this important point, involving, as it does, the fundamental question as to what temperature rise should be allowed in first-class modern electrical machinery, the Commission, rather than force a vote on a subject not yet ripe for decision, referred this particular point back to the National Committees for further consideration. It is hoped that a definite decision, satisfactory to all, may be arrived at in San Francisco in 1915. M. Maurice Leblanc was unanimously elected the new president, and the statutes having been modified accordingly, he will assume office for two years. Colonel Crompton was re-elected hon. secretary. The Spanish delegates invited the Special Committee to hold their next meeting in Madrid, and the Russian delegate, on behalf of his Committee, invited the I.E.C. to go to St. Petersburg in 1917. A most cordial telegram was received from the Kaiser in answer to one dispatched at the close of the official opening.

Appointments Vacant.—Assistant telegraph superintendent for the Great Indian Peninsula Railway (Rs. 500 to Rs. 700 per month, passage paid); shift engineer for Rathmines U.D.C. (35s.); electrician attendant for the County Asylum, Rainhill, near Liverpool (£50 +); shift engineers for the Waihi Gold Mining Co., New Zealand, for their new hydro-electric power station at Hora Hora (£4 per week + quarters). See our advertisement pages to-day.

Inquiries.—Makers of the White-Bartlett Static Electro-Medical Apparatus are asked for.

Accidents.—On Monday, the 8th inst., a fireman named Taylor met with a serious accident while attending to the coal-elevating and conveying plant at the Stretford U.D.C. Electricity Works. Shortly after his coming on night-shift duty some trouble occurred with the working of the overhead worm conveyor to boiler hoppers, and while attending to the gearing Taylor was caught in the machinery and his right arm was terribly mutilated. The injured man was subsequently removed to the Manchester Infirmary, where later his arm was amputated. Taylor's condition was at first reported critical, but it is believed he is now well on the way to recovery.

An employé named Nield, at the Oldham Corporation Electricity Works, Greenhill station, was suffocated on Monday, 15th inst. Deceased fell into the bunker while attending to the unloading of a coal truck. Efforts were ineffectually made to rescue him by means of a rope, but he gradually sank under the coal heap, which continued to shoot on him from the wagon. After an hour's hard work in emptying the bunker, the unfortunate man was extricated, but life was then extinct.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The Aylesbury U.D.C., which intends carrying out an electric lighting scheme for the town, has appointed MR. W. A. TURNBULL, of Stoke-on-Trent, as resident engineer, at £200 a year.

The Malvern Urban Council has chosen three candidates for an interview, out of forty applicants for the post of gas and electrical engineer, vacant through the resignation of MR. W. J. RENDELL BAKER, who has secured an appointment at Mansfield. The salary is £350, rising to £400. The selected candidates are :—Mr. F. H. G. Goodwin, assistant constructional engineer to the Salford Gas Department; Mr. W. H. Johns, resident assistant engineer and superintendent, Saltley Gas Works; and Mr. H. Marsden, gas and electrical engineer to the Honley Urban District Council.

On September 4th the marriage of MR. PERCY M. SHEARS, of the Hackney Borough Council Electricity Department, to Miss Ada Glass, was solemnised at St. Thomas' Church, Upper Clapton. A presentation was made to Mr. Shears from his many friends on the staff of the Borough Council.

The Shoreditch B.C. Law and Establishment Committee recommends that the salary of MR. W. S. CLARK, the chief clerk of the electricity supply department, be increased from £250 to £275, as from September 30th, with a further annual increment of £25 to £300 maximum.

On Tuesday MR. W. J. RENDELL BAKER, gas and electrical engineer at Malvern for nine years, and now leaving for Mansfield, was presented with an upright grand piano by the employés of the

department and many friends. Councillor Moerschell, chairman of the Gas and Electricity Committee, made the presentation. On Monday Mr. Baker was the guest of a number of friends at dinner, and was presented with a pair of solid silver candlesticks.

Tramway Officials.—The salary of Mr. R. L. Horsfield, manager of the Walsall tramways, is to be increased from £400 to a maximum of £500 a year by half-yearly increments of £25.

Mr. Henry Mozley, general manager to Burnley Corporation tramways, who has been nominated a vice-president of Burnley Chamber of Commerce, is, along with Councillor John Holden, a delegate at the autumnal meetings of the Associated Chambers of Commerce of the United Kingdom.

Mr. C. W. Shepherd, manager of the Edinburgh tramways, who recently underwent an operation for appendicitis, is progressing favourably.

Mr. Wm. German, who has been associated with the traffic and engineering department of the Blackpool Corporation tramways for 14 years, has now left the service to take up duties at the new Palatine Road schools. His late comrades presented him with a gold watch, the gift being handed over by Mr. C. Furness, general manager.

Mr. L. Johnston, general manager and engineer of the Gloucester tramways, has been appointed tramway manager at Southampton; 38 applications were received for the post.

General.—Last Friday night the employés of Messrs. T. W. Broadbent, Ltd., of Victoria Electrical Works, Huddersfield, made a presentation to Mr. Victor Broadbent (nephew of the head of the firm), who is to be married in London on Saturday next, September 20th. The presentation took place in the drawing office, the secretary, Mr. W. Dickens, occupied the chair, and called upon Mr. J. L. Stokes, foreman of the pattern department, to make the presentation. Mr. Stokes, in doing so on behalf of the employés, wished Mr. Broadbent and his future partner much happiness. Mr. Broadbent in suitable terms, acknowledged the present, which took the form of an electric clock mounted in oak case. At the close of the meeting Mr. Dickens stated that Mr. Victor Broadbent had just been made a member of the board of directors, and hoped that his connection with the firm would be a long and happy one.

Mr. H. Drury, who has for 12 years been in the cable department of Messrs. Johnson & Phillips, Ltd., Charlton, is leaving for Cleveland, Ohio, and he has been presented by those engaged in the department with a purse of gold and a smoker's outfit.

It is announced that Mr. Walter Hull, formerly of Stalybridge, has been appointed chief engineer to an English firm who are about to establish works in South Africa. Mr. Hull was, until lately, chief electrical engineer to the Priestman Collieries, Ltd, and prior to securing that position was with Messrs. Cammell, Laird & Co., at Sheffield.

Mr. Henry Hirst, of Ashton-under-Lyne, has been appointed head-master of the Hyde Technical School.

Mr. John Buchanan, foundry manager to Messrs. Willans and Robinson, Ltd., who has resigned, has been presented by the employés with a roll-top desk, and a silver card-case for Mrs. Buchanan.

On the occasion of his marriage to Miss D. M. Barton, Mr. Frederick George Broadhead, of the engineering staff of Siemens Bros. Dynamo Works, Stafford, has been presented by his colleagues with a silver tea and coffee service, a silver spirit kettle and stand, a silver tray and a service of table glass, while from the shop engineers at the works he received a case of fish-eaters and table glass.

The *Australian Record* states that Mr. W. Corin has been appointed chief electrical engineer at the Department of Public Works.

Our Australian exchange, the *Mining and Engineering Review*, states that Mr. Percy Rosling, who for some years past has been Australasian manager for W. T. Henley's Telegraph Works Co., Ltd., and who recently visited London, is returning by the R.M.S. *Macedonia* which left Melbourne on August 26th. "Mr. Rosling will in future reside in London, and be associated with the same firm. His departure will be greatly regretted by the Victorian Institute of Electrical Engineers, of which he is a past president and member of the council. . . . A sad circumstance in connection with Mr. Rosling's return is that on Monday last he received a cable announcing the death of his wife. Mrs. Rosling had been in indifferent health for some time past."

Mr. A. R. Wood, late manager of the electrical cooking and heating department of the General Electric Co., Edgbaston Works, at Birmingham, has resigned his position in order to take up a similar appointment with the Carron Co., of Stirlingshire. This firm is now extending its works in order to cope with the ever-increasing demand for electric cooking and heating apparatus. Mr. Wood has had 14 years' experience with the General Electric Co.

Obituary.—H. Aron.—We regret to announce the death of Prof. Hermann Aron, which occurred suddenly, in his sixty-eighth year, at Homburg v.d. Höhe, on August 29th last. The name Aron has been carried all over the world by the clock meter which Dr. Aron devised in 1884 when the electrical industry was in sore need of a reliable and commercial instrument for measuring electrical energy, and by the Aron two-wattmeter connection for the measurement of three-phase power. This connection and the formulæ to be used with it were evolved quite theoretically, Aron having no three-phase supply available with which to verify his deduction. His first book, published in 1876, dealt with the theory of condensers, and among his later works were volumes treating of the theory of the microphone, and the theory and application of secondary cells. Besides placing a number of successful commercial instruments and apparatus on the market, the professor carried out much experimental and speculative work in electrotechnics and physics, and was intimately associated with many German technical societies and commissions.

The death has occurred in his fifty-sixth year of Councillor Alfred Ebbs, chairman of the Electricity Committee of the Hammersmith Borough Council.

NEW COMPANIES REGISTERED.

Ajax, Ltd. (130,899.)—This company was registered on September 4th, with a capital of £2,500 in £1 shares, to take over the business of manufacturers and vendors of electric appliances and dry cell batteries carried on by C. A. Cooper, at 25, Holborn Viaduct, E.C., as the "British Electric Institute," and to carry on the business of electrical engineers and contractors, suppliers of electricity, manufacturers of, and dealers in, "Ajax" dry cell batteries, and magnetic, electric and other appliances, &c. The subscribers (with one share each) are:—F. Stretton, 147, Nelson Road, Hornsey, N., clerk; W. Berner, 4, Leinster Road, Kilburn, clerk. Private company. The number of directors is not to be less than two or more than five; the first are C. A. Cooper and T. W. Norman, chairman (both permanent). Registered office, 25, Holborn Viaduct, E.C.

G. C. Accumulator, Ltd. (130,888).—This company was registered on September 3rd, with a capital of £250 in 1s. shares, to carry on the business indicated by the title, and that of financiers, promoters, bankers, underwriters, concessionaires, &c. The subscribers (with one share each) are:—R. Warner, 10, Walbrook, E.C., accountant; E. Brooker, 10, Walbrook, E.C., secretary. Private company. Table "A" mainly applies. Registered by R. Warner, 10, Walbrook, E.C.

Liverpool Electric Welding Co., Ltd. (130,892).—This company was registered on September 3rd, with a capital of £1,000 in £1 shares (700 5 per cent. cumulative preference), to carry on the business of welders by means of electricity, welders of steam and other boilers, furnaces, combustion chambers and boiler shells, boiler makers and repairers, &c. The subscribers (with one share each) are:—W. A. M. Wachsmuth, 38, Madelaine Street, Liverpool, boiler maker; E. Jones, 53, Beaconsfield Street, Liverpool, boiler maker; H. Woods, 31, Patterdale Road, Liverpool, gentleman. Private company. The first directors are W. A. M. Wachsmuth, E. Jones and H. Woods; solicitor, H. T. Ellis, 6, Castle Street, Liverpool. Registered office, 16, Seaton Buildings, 17, Water Street, Liverpool.

Brilliant Signs Letras Morgan (South America), Ltd. (130,885).—This company was registered on September 3rd, with a capital of £5,000 in £1 shares (4,000 7 per cent. cumulative preference), to carry on the business of manufacturers of and dealers in brilliant sign and other letters, tablets, show cases, shop fittings and decorative panels, &c., to acquire from R. H. Morgan the business carried on by him at 951, Calle Uruguay, Buenos Ayres, Argentina, and the registered trademark or name of Letras Morgan, together with all agencies held by him, and to adopt an agreement with the Brilliant Sign Co. (1907), Ltd. The subscribers (with one share each) are:—W. Holtham, 46, Navarino Road, Hackney, N.E., clerk; T. W. Doran, 4, Fernleigh Drive, Leigh-on-Sea, clerk. Private company. The number of directors is not to be less than two or more than five; the first are not named; remuneration as fixed by the company. Registered by Ingle, Holmes, Sons and Pott, Capel House, E.C.

Atmospheric Nitrates (Kilburn Scott Patents), Ltd. (130,902).—This company was registered on September 4th, with a capital of £12,600 in £1 shares (12,500 ordinary, 10 founders' "A," and 90 founders' "B"), to acquire from E. K. Scott the benefit of and turn to account certain existing inventions relating to the fixation of nitrogen from air, to carry on the business of electrical engineers and contractors, chemists, druggists, drysalters, oil and colourmen, manufacturers of and dealers in acids, &c. The subscribers (with one share each) are:—E. K. Scott, Osborne House, Belvedere, Kent, electrical engineer; R. McDougall, City Flour Mills, German Street, Manchester, corn merchant and miller; I. McDougall, 68, Port Street, Manchester, manufacturing chemist. Private company. The number of directors is not to be less than two or more than seven; the first are E. K. Scott, R. McDougall, I. McDougall, F. Howles, and S. McDougall; qualification, 200 shares; remuneration as fixed by the company. Solicitors: Richard Hankinson & Co., Manchester. Registered by T. T. Hull & Son, 22, Chancery Lane, W.C.

Grindell Matthews Radiophone Syndicate, Ltd. (131,006).—This company was registered on September 11th, with a capital of £10,000 in £1 shares, to carry on the business of a telephone, telegraph, general engineering and finance syndicate. The subscribers (with one share each) are:—G. W. Edgelow, 341, Clapham Road, S.W., clerk; P. B. Keeble, 19, Hamilton Square, S.E., clerk. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first. Registered by Hennen, Edgelow & Castellan, solicitors, Quality Court, Chancery Lane, W.C.

Clonakilty Electric Light and Power Co., Ltd. (4,037).—This company was registered in Dublin on September 8th, with a capital of £2,500 in £1 shares, to carry on the business of electricians, mechanical engineers and manufacturers, &c. The subscribers (with one share each) are:—J. Crowley, Homeville, Clonakilty, national teacher; J. Connolly, Mill Street, Clonakilty, merchant. Private company. The number of directors is not to be less than three or more than five; the first are P. W. O'Donovan, J. McCarthy, P. O'Sullivan, P. Hill and M. Sheehy; qualification, £100; remuneration, two guineas each per annum. Registered office, 43, Sovereign Street, Clonakilty, Co. Cork.

Brown & Parsons (1913), Ltd. (130,962).—This company was registered on September 9th, with a capital of £2,000 in £1 shares, to take over the business of an electrical, mechanical and general engineer and contractor, carried on by S. Hill, at 63, Parade, Leamington, in succession to "Brown and Parsons, Ltd." The subscribers (with one share each) are:—F. E. Brown, 63, Parade, Leamington Spa, electrical engineer; G. Williams, 156, Edmund Street, Birmingham, solicitor. Private company. Table "A" mainly applies. Solicitor: G. Williams, 156, Edmund Street, Birmingham. Registered office, 63, Parade, Leamington.

Woolnough, Lang, Ltd. (130,958).—This company was registered on September 8th, with a capital of £5,000 in £1 shares (1,000 founders), to carry on the business of electrical and mechanical engineers as formerly carried on by F. Woolnough, at Norwich, as the St. Stephens Engineering Works. The subscribers (with 12 shares each) are:—F. Woolnough, St. Stephens Engineering Works, Norwich, electrical engineer; C. H. D. Lang, 14, Greencroft Gardens, Hampstead, N.W., electrical engineer. Private company. The number of directors is not to be more than two; the first are F. Woolnough and C. H. D. Lang (both permanent, subject to holding 100 shares each); qualification of ordinary directors, five ordinary shares. Registered office, St. Stephens Engineering Works, St. Stephens Street, Norwich.

Electric Motor and Stove Hiring Co., Ltd. (130,965).—This company was registered on September 9th, with a capital of £5,000 in £1 shares, to let out on hire, hire-purchase, or to sell outright, electric motors, generators, cookers and radiators, &c. The subscribers (with one share each) are:—J. C. B. Ingleby, Woodville, Old Park Road, Roundhay, Leeds, electrical engineer; H. S. Ingleby, Woodville, Old Park Road, Roundhay, Leeds, electrical engineer. Private company. The number of directors is not to be less than two or more than seven; the first are J. C. B. Ingleby, E. J. Ingleby, H. S. Ingleby, and E. C. Ingleby (all life directors); qualification, £100; remuneration as fixed by the company. Registered office, 92, Elland Road, Leeds.

I.L. Syndicate, Ltd. (130,968).—This company was registered on September 9th, with a capital of £2,600 in £1 shares, to acquire from F. L. Hollister certain patents, rights and protections relating to machines for generating electric current for ignition, illumination and otherwise; to carry on the business of electricians, engineers, &c. The subscribers are:—G. J. Lothian Nicholson, 25, Walpole Street, Chelsea, S.W., engineer, 25 shares; A. A. Holle, 22, Clarges Street, W., engineer, 100 shares. Private company. The number of directors is not to be less than three or more than seven; the first are A. A. Holle, G. J. Lothian Nicholson, A. G. Morrish, F. L. Hollister and W. E. Dommett; qualification, £25. Registered office, 34-36, Gresham Street, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Dartmoor Electric Supply Co., Ltd.—"B" debenture dated August 22nd, 1913, to secure £800, charged on the company's undertaking and property, present and future, including uncalled capital (subject to a first mortgage deb. issue of £1,200). Holders: Lloyds' Bank, Ltd., Lombard Street, E.C.

James Jackson & Co., Ltd.—Mortgage dated May 20th, 1913, to secure £475, charged on buildings, workshop and yard at Eckington, Derby. Holder: W. E. Booth, Batley (filed August 27th, pursuant to order of Court).

Cable Accessories, Ltd. (93,345).—Capital, £7,000 in £1 shares. Return dated May 22nd (filed May 28th), 1913. All shares taken up. £1 per share called up on 2,612, 10s. on 172, and 5s. on 1,166. £2,989 10s. paid. £3,050 considered as paid on 3,050 shares. Mortgages and charges: Nil.

Hong Kong Tramways Co., Ltd. (75,486).—Capital, £81,250 in 5s. shares. Return dated May 29th, 1913 (filed June 5th, 1913). All shares taken up. £81,250 considered as paid. Mortgages and charges: £190,000.

D. Hulett & Co., Ltd. (29,463).—Return dated August 11th, filed August 21st, 1913. Capital, £95,000 in £5 shares. 6,000 shares taken up. £5 per share called up on 1,900. £9,500 paid. £20,500 considered as paid on 4,100 shares. Mortgages and charges: Nil.

D.P. Battery Co., Ltd. (44,084).—Return dated June 22nd, filed June 28th, 1913. Capital, £10,000 in £1 shares (4,996 "A," 4,996 "B," and eight others). All shares taken up. £10,000 paid. Mortgages and charges: £12,000.

W. Parsons & Co., Ltd.—Particulars of £300 debentures, created August 28th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908; the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled and unpaid capital. No trustees.

Allen West & Co., Ltd.—Particulars of £6,000 debentures, created August 20th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908; the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

J. G. White & Co., Ltd. (66,568).—Capital, £200,000 in 15,000 pref. shares of £10 each, and 50,000 ord. shares of £1 each. Return dated July 10th, 1913 (filed July 14th). All shares taken up. £10 per share called up on 15,000 pref. £150,000 paid. £50,000 considered as paid on 50,000 ord. shares. Mortgages and charges: Nil.

Merthyr Electric Traction and Lighting Co., Ltd.—Capital, £100,000 in £5 shares (10,000 pref. and 10,000 ord.). Return dated June 2nd, 1913 (filed July 8th). 6,000 pref. and 8,000 ord. shares taken up. £5 per share called up on 6,000 pref. and 6,000 ord., and £3 per share on 2,000 ord. £66,000 paid. Mortgages and charges: £48,400.

Dartmoor Electric Supply Co., Ltd.—Issue on August 22nd, 1913, of £700 debentures, part of a series of which particulars have already been filed.

Electromobile Co., Ltd.—Issue on September 8th, 1913, of £184 17s. 6d. debentures, part of a series of which particulars have already been filed.

Ajax, Ltd.—Particulars of £2,000 debentures, created September 8th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act of 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital (if any). No trustees.

Ennig Electric Light and Power Co., Ltd.—Debenture dated September 4th, 1913, to secure £200, charged on the company's property, present and future, including uncalled capital. Holder: W. Jones, Gendre, near Talgarth.

Spagnoletti, Ltd.—Charge on freehold land in Cumberland Avenue, Willesden, dated August 21st, 1913, to secure all moneys due or to become due from the company to London County and Westminster Bank, Ltd., 41, Lothbury, E.C.

CITY NOTES.

Yorkshire Electric Power Co.

The half-yearly meeting of this company was held at the Hotel Metropole, Leeds, on 16th inst. The chairman (Mr. A. G. Lupton) said that in accordance with their custom they had not issued a printed copy of the accounts for the half-year, but the report showed that very material progress had been made. At their corresponding half-yearly meeting in September, 1912, they had to speak of the difficulties with which the company had been struggling, and shareholders accepted the assurances of the directors that these were temporary and would shortly be overcome, and that the year 1912 must be considered as quite exceptional to the steady progress of the company. Now they were in the more satisfactory position of being able to point to the fulfilment of these anticipations. The revenue for the half-year, which in 1912 was £20,357, had this half-year amounted to £30,132, an increase at the rate of 48 per cent. The prices of coal had been heavy, but in spite of this the accounts showed a profit of £6,971 for the half-year. This, after payment of £3,307, the dividend on the preference shares, would leave £4,308 to carry forward, and the directors anticipated with confidence the balance-sheet which they would be able to present at the end of the present half-year. Included in this revenue was £529, dividend on the company's investment of nearly £9,000 in the Distribution Co., which had now reached a very satisfactory position. The waste heat station at Barugh, for which the first sod was cut in August, 1912, was now practically completed, and the machinery was being tested preparatory to being put to work on the commercial load. The first installation there was a 2,000-KW. turbine, but increasing demands for the company's supply had compelled the directors to place a further order for a 3,000-KW. turbine, and the completed station of 5,000 KW. would be a useful addition to the plant of the company and add greatly both to security and efficiency. Of the further £50,000 issue of 6 per cent. preference shares in this company authorised last year, and the £25,000 5½ per cent. first mortgage debenture stock of the Waste Heat Co., considerably more than half had been taken up, and applications for the balance were steadily coming in. The directors were largely interested in both securities and recommended either of them as a sound investment. Application forms would be sent out with the report of the meeting to all shareholders, so that those who desired might avail themselves of this good rate of interest. Since the first issue of preference shares was made, and the rate of 6 per cent. fixed, the position of the Power Co. had greatly improved, and in his (the speaker's) opinion so soon as this issue had been absorbed, if any further preference shares were offered, they ought to carry a lower rate of interest. They had again found it necessary to oppose provisions in applications made to Parliament which affected the company's powers, and as before had been entirely successful. Unfortunately, some of the local authorities were still in the mental condition of the medieval barons, and to a large extent governed the area which they were elected to serve from the point of view of finding what burdens and limitations they could impose on the manufacturers who brought wealth and prosperity to their districts, but this was gradually changing. The directors believed that the development of the company's supply was as much in the interest of local authorities and manufacturers as of the shareholders of the company, and anything which tended to restrict the operations of the company was to the ultimate detriment of the industries of the county. The company had justified the principles which underlay its formation. It was giving a large supply at prices undreamt of before, and the directors foresaw that future developments would be enormously greater, whilst it was gratifying to find that power-users and public bodies alike were realising that it was in the interests of the county that the supply of the company should be developed as rapidly as possible. The bulk supply of energy to local authorities and companies was steadily increasing. The company had just concluded an agreement with the undertakers of the Pontefract electric lighting order for a bulk supply in that borough, which brought the total agreements made by the company for a bulk supply to 23. Practically all these undertakings were working at a profit, and the directors were convinced that the 27 undertakings at work in the company's area which were not taking a supply from the company would be materially benefited if such supply were taken either in full or in part from their own supply. For some time the directors' attention had been increasingly drawn to one defect in their statutory powers. There were many districts where the population was too scattered to justify the cost of a distributing order, but they were precluded from supplying electricity for lighting purposes except to premises where power was used. Their company was formed amongst the earlier power companies, and to later ones authority had been given to supply current for lighting as well as for power only. It has been suggested to them that they should ask Parliament to give these same powers in those districts where there was no existing distributing company or authority, and the directors had this under their consideration. If this was decided upon, approval would be asked at the annual meeting in February. With respect to the vacancy on the board caused by the death of Mr. Robert Hudson, to whom the company was so much indebted from its inception, Mr. F. J. Kitson had consented to accept this seat on the board. Mr. Kitson had been a large shareholder, and much interested in the progress of the company from the first. The business of which he was chairman, was one of their largest customers, and his advice and assistance would be of great value to the company. The chairman invited shareholders to go over and see the central generating station at Thornhill. Mr. Woodhouse had arranged to show any visitors round the works on the afternoons of September 24th, 25th and 26th.

The report was adopted and the preference dividend authorised.

Dick, Kerr & Co., Ltd.—According to a financial daily, a final dividend of 3 per cent. has been declared on the 6 per cent. cumulative preference shares, payable October 1st.

Victoria Falls and Transvaal Power Co.

The directors' report for the year ended December 31st, 1912, which was issued last week, states that at that date the issued share capital amounted to £3,000,000 and the debenture capital to £4,000,000, having been increased by £1,000,000, as referred to in the last report. The year's business (says the *Financial News*) has resulted in a profit of £446,380, which, with the balance of £45,744 at the credit of the profit and loss account as at December 31st, 1911, remaining after payment of the dividend declared on May 23rd, 1912, makes a gross total of £492,124. The substantial increase in the revenue, of £123,286 as compared with the preceding year, is a noticeable factor in the company's increasing prosperity. This result has been obtained notwithstanding that on October 1st, 1912, the reduction in the price of power came into force, in accordance with the terms of the contracts with consumers, and, further, that £1,000,000 of capital was unproductive, due to constructional work still being in progress. After providing for interest on debentures for the year 1912, amounting to £174,703, and for depreciation, amounting to £102,054, the balance remaining is £215,367. In respect of this balance the directors, on June 5th last, declared a dividend at the rate of 3 per cent. per annum (less income-tax) for the 12 months ended December 31st, 1911, on the amounts for the time being paid up on the preference shares. This dividend was paid to the shareholders on June 14th, 1913, and absorbed £118,580, leaving £96,787 to be carried forward. The period under review has been marked by continued increases in the demands for power made by the consumers of this company and the Rand Mines Power Supply Co., Ltd. The Vereeniging power station, since it came into commission in September, 1912, has proved entirely reliable, the supply of power being delivered and maintained over the 32 miles of transmission line without any of the earlier troubles. In order to meet the demands of the consumers of both companies for power and to provide adequate reserve plants, contracts for further machinery to supply 90,000 H.P. have been entered into.

Stock Exchange Notices.—The Committee has appointed a special settling day, as under :—

Thursday, October 2nd.—International Light and Power Co., Ltd.—Fully-paid scrip certificates for $931,900 common stock in shares of $100 each, and for $1,000,000 6 per cent. cumulative preferred stock in shares of $100 each.

And ordered the undermentioned securities to be quoted in the Official List :—

Alabama Traction, Light and Power Co., Ltd.—$6,000,000 5 per cent. first mortgage 50-year gold bonds, Nos. A 1 to 3,000 of $100 and B 1 to 11,400 of $500 each, in lieu of the scrip.

Mansfield and District Tramways, Ltd.—Further issue of 17,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 60,001 to 77,000.

Application has been made to the Committee to allow the following security to be quoted in the Official List :—

North Metropolitan Electric Power Supply Co.—Further issue of £40,000 5 per cent. mortgages, Nos. 1,501 to 1,900 (registered).

Dundee, Broughty Ferry and District Tramways Co., Ltd.—The directors report that the profit for the past year, including the sum brought forward, after providing for interest on debenture stock, amounts to £5,104. The interim dividend on the preference shares (6 per cent. per annum) less tax, absorbed £1,412. The directors propose to pay the final dividend on preference shares, £1,412 ; putting to renewals fund, £600 ; and to sinking fund for redemption on debenture stock, £600 ; and to pay a dividend on the ordinary shares at the rate of 2½ per cent. per annum for the year to July 31st, less tax, £676, leaving £402 to be carried forward. The receipts have been very well maintained.

Callender's Share and Investment Trust, Ltd.—The directors' report for the period from May 10th, 1912 (the date on which the company commenced business), to August 31st, 1913, shows a gross profit of £19,227, and after providing for debenture interest and calls in advance there is available a balance of £12,205. The directors recommend a dividend at the rate of 5 per cent., place £1,800 to redemption fund, and carry forward £2,135. The meeting was held yesterday afternoon.

Direct Spanish Telegraph Co., Ltd.—The directors announce, in addition to the dividend at the rate of 10 per cent. per annum on the preference shares, a dividend at the rate of 4 per cent. per annum, free of income-tax, on the ordinary shares, both for the half-year ended June 30th last, and payable on October 1st.

Bromley (Kent) Electric Light and Power Co., Ltd.—The directors have declared an interim dividend at the rate of 4 per cent. per annum (2s. per share), less income-tax, on the ordinary shares for the half-year to December 31st, payable October 1st.

Continental.—Switzerland.—The Oerlikon Maschinenfabrik Gesellschaft, of Oerlikon, near Zurich, is declaring a dividend of 7 per cent. for the last financial year, as compared with only 5 per cent. in the preceding 12 months.

Gateshead and District Tramways Co.—The directors announce an interim dividend at the rate of 5 per cent. per annum on the ordinary shares for the half-year.

Winnipeg Electric Railway Co.—A quarterly dividend of 3 per cent. is announced, payable October 1st.

STOCKS AND SHARES.

Tuesday Evening.

The Stock Exchange is taking time to get into anything that approaches a regular swing of business. Investment orders remain in the majority. Speculation is rife only in the American market, and even there it comes in gusts. Money, however, is plentiful, if not particularly cheap. Confidence begins to return to the mind of the investor, for whose delectation, we may observe, dozens of schemes are germinating in the active brains of those who want his money. But while Consols improved, Home Rails went flat. Rubber shares drifted to the verge of demoralisation.

The Home Railway market, after holding up with a certain degree of firmness, developed acute depression as the result of the threatened general strike on the London and North-Western Railway system. This, combined with minor causes, such as the re-opening of the Midland inquiry, and the difficulty with some of Tilling's men, led to prices being severely shaken, and in the débâcle all the sections sympathised. Metropolitans dropped 1¼ to 46, Districts ½ to 34¼. Underground Electric shares had been firm, the £10 variety being up to 4$\frac{1}{16}$, but they could not withstand the railway flatness, with the Tilling trouble as well, and the price went back to 3¾. British Electric Tractions have come into demand. The first Debenture stock rose 2½, the second gained a point, and so did the 7 per cent. non-cumulative Preferred stock.

Pronounced strength remains the feature of the market for English Electricity Supply shares. It has been helped considerably by rumours revived as to a possible taking-over of the City of London Company by the Corporation of London. Of the truth of these reports we have been unable to obtain satisfactory verification or denial ; all we can say is that some of the people in the inner circles who are holders of the shares are not getting out. It may be recalled that the price went to 23½ when this rumour did duty before, since when the price has been down to 14¼—sufficient evidence of the extremely speculative character of the shares. The Preference shares rose £1 to 13½. County of London Ordinary are a strong market, and, in addition to the rise shown overleaf, there is a dividend of 6s. to be added this week. The Preference recovered the deduction of 6s. made last pay-day. Westminsters rose to 9 ; and the list as a whole, as already noticed, exhibits a strong appearance. Some of the people following the market, point out Metropolitans and South Londons as being cheap at their present quotations at 3⅝ and 3$\frac{1}{16}$ respectively. If the flare were to die out of Cities, it might affect the market as a whole, at any rate for a time.

Fresh reports of friction between Mexico and the United States have been taken calmly in the Stock Exchange. Mexican Railway issues have shot up during the past 10 days. The utility companies' issues have quietly moved upwards. Mexican Light and Power First Mortgage bonds rose ½, and the Preferred put on 2¼. The group as a whole is steady, and there is more disposition to buy Canadian varieties than there has been of late. Calgary bonds hardened to 92. Montreal shares fell to 210, but regained the drop. Brazilian Traction Ordinary, after dipping to 95, have come up to 97½. Anglo-Argentine Tramway 5 per cent. Debenture stock is a little harder, justifying its recommendation made some few months ago when the price stood 4 points lower. Victoria Falls Power Preference shares improved to ⅛ upon the favourable nature of the report. The British Columbia Electric Railway group shows no significant change. Barcelona Trams spurted to 40.

In the Telegraph market the principal movement is a fall of ⅜ in West India and Panama Telegraph Second Preference, reducing the price to 9¼. There was a little pressure to sell, and the market was not anxious to take the stock. Commercial Cable Debenture eased off to 82½, and Anglo-American Preferred is a point down at 106½, the Deferred reacting to 23¼. On the other hand, American Telephone and Telegraph Capital stock rose 1½ upon the strength of the Yankee market, and other things in this section have been on the whole very firm. Great Northerns are 10s. up, as are also Indo-Europeans. Mackay Company's Common and Preferred have both regained their dividends. Monte Video Telephones drooped to 1. Dealings in Marconis have been fitfully active. The parent shares have risen on the negotiations between the Company and the Goldschmidt interests. Americans hardened to 1⅛, Canadians to 12s.

British Insulated and Helsby Cable shares put on a further 5s. at 8½ upon a steady demand which found comparatively few shares about to satisfy it. Castner-Kellners are $\frac{1}{16}$ up at 3$\frac{15}{16}$; and the only fall in the Manufacturing list is one of ¼ in General Electric 6 per cent. Preference shares, which left the middle price 9⅞.

Callender's Share and Investment Trust has published its maiden report, showing a dividend of 5 per cent. The 5 per cent. Debenture stock is quoted at 101½ middle.

The rubber share market has fallen into an extremely unsatisfactory condition, owing to a further shrinkage in the price of the raw stuff to 2s. 2½d. per lb. for plantation, although fine hard Para retains its steadiness at about 3s. 8d. per lb. Authorities in Mincing Lane and the Stock Exchange are nonplussed to explain the severity of the fall in plantation rubber, and admit that they are at a loss to forecast the outlook. Meanwhile the prices of shares continue to down-grade heavily, and the Stock Exchange market has dropped into a condition of extreme sensitiveness.

Lima Light, Power and Tramways Co.—A dividend of 1 per cent. has been declared in Lima for the quarter ended June.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations Sept. 16th.	Rise + or Fall —	Present Yield p.c.
	*	1912.	1913.			£ s. d.
Bournemouth & Poole, Ord.	10	6	5†	9¾ — 10¼	..	5 17 1
Do. 4½ % Pref.	10	4½	4½	8¾ — 9⅛	..	4 14 9
Do. Second 6 % Pref.	10	6	6	9⅝ — 10⅜	..	5 15 8
Do. 4½ % Deb. Stock	Stock	4½	4½	96 — 98	..	4 11 10
Brompton & Kensington, Ord.	5	10	9†	8¼ — 9	..	5 11 1
Do. 7 % Cum. Pref.	5	7	7	8⅝ — 8⅞	..	4 1 2
Central Electric Supply, 4 % Guar. Deb.	100	4	4	94 — 97	..	4 2 6
Charing Cross, West End & City	5	5	5†	4⅜ — 4⅞	..	5 2 7
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	..	4 17 3
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3½ — 4	..	5 12 6
Do. Do. 4 % Deb.	100	4	4	90 — 92	..	4 7 0
Chelsea, Ord.	5	5	4†	4½ — 5 xd	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	94 — 97	..	4 12 9
City of London, Ord.	10	9	6†	16½ — 17½	+1⅜	5 2 10
Do. 6 % Cum. Pref.	10	6	6	13 — 14	+1	4 5 9
Do. 5 % Deb.	Stock	5	5	114 —118	..	4 4 9
Do. 4½ % Second Deb.	100	4½	4½	99 —101	..	4 9 1
County of London, Ord.	10	6	5†	12 — 13	+1⅛	4 12 4
Do. 6 % Pref.	10	6	6	11⅞ — 12⅜ xd	+ ⅛	4 17 0
Do. 4½ % Deb.	Stock	4½	4½	102½ —104½	..	4 6 2
Do. 4½ % Second Deb.	Stock	4½	4½	98 —101	..	4 9 1
Edmundson's, Ord.	£3	..	..	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	5	6	6	4 — 4⅜	..	3 8 7
Do. 6% Non-Cum. Pref.	5	..	..	1⅝ — 2	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	80 — 83	..	5 8 5
Folkestone	5	6	6	4½ — 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4½ — 5	..	5 0 0
Do. 4½ % First Deb.	100	4½	4½	89 — 91	+1	4 19 0
Hove	5	9	..	7⅞ — 8⅛	..	5 9 1
Kensington & Knightsbridge, Ord	5	8	8†	7½ — 7⅞	..	5 3 3
Do. 4 % Deb.	Stock	4	4	88 — 91	..	4 7 11
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	74 — 78	..	5 15 5
London Electric, Ord.	3	2½	..	1⅛ — 1⅜	..	4 7 9
Do. 6 % Pref.	5	6	6	4⅜ — 5½	..	5 14 3
Do. 4 % First Mort. Deb.	Stock	4	4	89 — 92	..	4 7 0
Metropolitan	5	4	4†	3⅜ — 3⅝	..	5 3 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜	..	5 0 0
Do. 4½ % First Mort. Deb.	Stock	4½	4½	96 — 99	..	4 10 1
Do. 3½ % Mort. Deb.	Stock	3½	3½	78 — 81	..	4 6 5
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98 —101	..	4 19 0
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9⅜ — 10⅜	..	5 11 7
Oxford	5	7	6†	5¼ — 6⅜ xd	..	5 9 10
St. James' and Pall Mall, Ord.	5	10	10†	8¾ — 9¼	..	5 8 1
Do. 7 % Pref.	5	7	7	6½ — 7	..	5 0 0
Do. 3½ % Deb.	100	3½	3½	83½ — 85½	..	4 1 10
South London, Ord.	4	5½	..	2⅜ — 3¼	..	6 15 4
Do. 5 % First Mort. Deb.	100	5	5	96 — 99	..	5 1 0
South Metropolitan, 7 % Pref.	1	7	7	1 3/32 — 1 5/32	..	6 1 3
Do. 4½ % First Deb. Stock	100	4½	4½	96 — 99	..	4 10 6
Urban, Ord.	£3	Nil	..	⅛ — ¼	..	..
Do. 5 % Cum. Pref.	5	3	..	2⅜ — 2⅝	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	85 — 88	..	5 2 3
Westminster, Ord.	5	10	10†	8¾ — 9½	+ ⅛	5 8 1
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 5½	..	4 5 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6†	4⅞ — 5⅛	..	5 17 1
Calcutta, Ord.	5	8½	..	7 — 7⅛	..	5 13 4
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	..	4 17 6
Calgary Power, 1st Mort. Bds.	100	5	5	91 — 93	+ ½	5 7 6
Canadian Gen. El. Com.	$100	7	7†	113 —117	..	5 19 8
Do. 7 % Pref.	$100	7	7	119 —124	..	5 12 11
Cordoba Lt., Power and T., Ord.	1	5	..	⅝ — ¾	..	6 8 1
Do. 5 % Deb.	100	5	5	93½ — 95½	..	5 4 9
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	92 — 94	..	6 7 8
Elec. Supply Victoria, 6 % 1st Mort. Deb.	100	5	5	87½ — 90½	..	5 10 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	£0½ — 92½	..	5 8 2
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/32 — 3/32	..	Nil
Do. 6 % Pref.	1	6	..	3/16 — 7/16	..	10 13 4
Kaministiquia Power, 5 % G. Bs.	$500	5	5	102 —104	..	4 16 2
Madras, Ord.	£	Nil	..	1¼ — 1⅜	..	..
Melbourne, 6 % 1st Mort. Deb.	100	6	5	103 —106	..	4 14 4
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	78 — 82	..	6 1 11
Mexican Lt. & Power, Common	$100	4	4	66 — 70	..	5 14 4
Do. 7 % Cum. Pref.	$100	7	7	97½ —102½	+2½	6 16 7
Do. 5 % 1st Mort. Gold Bds.	..	5	5	91 — 93	+ ½	5 7 6
Do. 5 % 2nd Mort. Bonds	100	5	5	78 — 80	..	6 5 0
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	74 — 77	..	6 9 10
Montreal, Lt., H. and Power	$100	9	10†	215 —225	..	4 0 0
Northern, Lt., Power and Coal, 6 % 1st Mort. Bonds	$500	5a	5a	15 — 25	..	..
River Plate, Ord.	Stock	10	..	207 —217	..	4 8 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	102 —107	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	97½ — 99½	..	4 19 6
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	101 —103	..	4 7 5
Shawinigan Water, Capital	$100	5½	6†	140 —144	..	3 16 5
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	105½ —107½	..	4 13 0
Do. 4½ % Per. Deb.	Stock	4½	4½	100¼ —102½	+1	4 7 10
Toronto Power, 4½ % Deb.	Do.	4½	4½	97 —100	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	90½ — 92½	..	5 8 1
Victoria Falls Power, Pref.	1	6	6	⅜ — ⅞	+1/16	6 17 2
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105 xd	..	5 14 3

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4½	..	6⅞ — 7⅛	..	6 2 0
Do. 5 % Deb. Red.	Stock	5	5	94 — 96	..	5 2 2
American Telep. & Teleg., Cap.	$100	8	8	184 —186	+1½	5 17 8
Do. Collat. Trust	$1000	4	4	90 — 92	..	4 7 0
Anglo-American Telegraph	Stock	3	3	62 — 65	..	4 12 4
Do. 6 % Pref.	Do.	6	6	106 —107	—1	5 12 2
Do. Def.	Do.	30/-	..	23 — 23½	— ½	6 7 8
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	8	..	7⅜ — 7⅝	+1/16	5 5 0
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	81½ — 83½	— ⅓	4 15 10
Cuba Telegraph	10	6	6†	8½ — 9½	..	6 9 9
Do. 10 % Pref.	10	10	10	14½ — 15½	..	6 9 0
Direct Spanish Telegraph, Ord.	5	4	4	8½ — 8⅝	..	5 6 8
Do. 10 % Cum. Pref.	5	10	..	6¾ — 7½	..	6 12 0
Direct United States Cable	10	4	4†	6⅜ — 7⅛	..	5 12 3
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7	127 —130	..	5 7 8
Do. 8½ % Pref. Stock	Do.	8½	8½	75 — 77	..	4 10 11
Do. 4 % Mort. Deb.	Do.	4	4	95 — 97	..	4 2 6
Eastern Extension	10	7	7	12½ — 13	..	5 7 8
Do. 4 % Deb.	Stock	4	4	92 — 94	..	4 5 1
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	99 —101	..	3 19 3
Globe Telegraph and Trust	10	6	6†	11 — 11½	..	5 4 4
Do. 6 % Pref.	10	6	6	12 — 12½	— ⅛	4 16 0
Great Northern Telegraph	10	20	5†	80½ — 82½	+ ½	6 3 1
Indo-European Telegraph	25	13	..	56 — 58	+ ½	5 12 1
Mackay Companies Common	$100	5	5	85 — 88 xd	+1½	5 13 8
Do. 4 % Cum. Pref.	$100	4	4	66 — 70 xd	+1	5 14 4
Marconi's Wireless Telegraph	1	20	..	4 — 4¼	+ ⅛	4 16 10
Do. 7 % Cum. Partic. Pref.	1	17	..	3 5/16 — 3 7/16 xd	..	4 18 11
Monte Video Telephone, Ord.	1	6	6	1 5/16 — 1 7/16	— 1/32	5 13 0
Do. 5 % Pref.	1	5	5	¾ — ⅞	..	5 14 8
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	100 —101	..	4 9 1
Oriental Telep. and Elec.	1	10	..	1 23/32 — 1 27/32	..	5 8 6
Do. 6 % Cum. Pref.	1	6	6	1 5/16 — 1 7/16	..	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	86 — 88	..	4 10 11
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	96½ — 98½	+ ½	4 1 8
Reuter's	10	10	10†	9¾ — 10¼	..	9 17 6
Submarine Cables Trust	Cert.	6	6	124 —127	..	4 14 6
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	95 — 97	..	4 12 9
United River Plate Telephone	5	8	6†	6½ — 7	..	5 14 4
Do. 5 % Cum. Pref.	5	5	5	5 — 5½	..	4 11 0
West Coast of America	2½	2½	..	1 5/16 — 1 7/16	..	4 8 4
Do. 4 % Debs., 1 to 500 guar. by Bras. Sub. Tel.	100	4	4	94 — 97	+1	4 2 6
West India and Panama Teleg.	10	1½	..	2⅜ — 2⅞	..	4 6 11
Do. 6 % Cum. 1st Pref.	10	6	6	9⅝ — 10⅜	..	5 18 5
Do. 6 % Cum. 2nd Pref.	10	6	6	9 — 9½	— ⅛	6 6 4
Do. 5 % Debs.	100	5	5	99 —101	..	4 19 0
Western Telegraph, Ltd.	10	7†	7	12⅜ — 13½	..	5 5 8
Do. 4 % Deb.	Stock	4	4	91 — 93	+ ½	4 6 0
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	93 — 95	..	4 14 9

*Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. 8s. in Funded Dividend Certs.

Continued on next Page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations Sept. 16th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref. Ord.	*	Nil	..	⅞ — 1	..	Nil
Do. 5 % Pref.	1	5	5	3⅜ — 3⅝	..	6 8 0
Do. 4½ % Deb.	100	4½	4½	72 — 77	..	5 17 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	11½ — 13	..	..
Do. Do. Deferred	100	..	..	4½ — 6	..	..
Do. Do. 6 % Cum. Pr'f	100	6	6	86 — 89	..	6 14 10
Do. 7 % Non-Cum. Pr'f.	100	3	..	48 — 51	+1	5 17 8
Do. 5 % Perp. Deb.	100	5	5	93½ — 95½	+2½	5 8 8
Do. 4½ % 2nd Deb.	100	4½	4½	76 — 79	+1	5 14 0
Central London Railway, Ord.	100	3	3	73 — 75	..	4 0 0
Do. Gtd. Assented	100	..	4	80 — 82	..	4 17 7
Do. Pref.	100	4	4	77 — 79	..	5 1 3
Do. Gtd. Assented	100	..	4	81 — 83	..	4 16 8
Do. Def.	100	2	..	75 — 77	..	2 12 0
Do. Gtd. Assented	100	..	4	79 — 81	..	4 18 9
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	98 — 100	..	5 0 0
Do. Do. 1896	100	5	5	98 — 100	..	5 0 0
Do. Do. 1901	100	5	5	97 — 99	..	5 1 0
Do. Do. 1908	100	5	5	97 — 99	..	5 1 9
Do. 4 % Deb.	100	4	..	93 — 95	..	4 4 3
Hastings Trams, 6 % Pref.	1	6	6†	⅞ — ⅞	..	7 13 7
Do. 4½ % Deb.	100	4½	4½	63 — 73	..	6 8 3
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2⅛ — 2⅝	..	4 15 3
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	76 — 78	..	6 8 2
London and Suburban, Ord.	1	..	..	⅛ — ⅜	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	1/16 — 1/8	..	..
Do. Do. 4½ % 1st. Deb.	100	4½	4½	74 — 79	..	5 13 11
London Elec. Railw'ys, 4 % Deb.	100	4	4	91 — 93	..	4 6 0
London United Trams, 4 % Deb.	100	4	4	61 — 65	..	6 3 1
Metropolitan Railway Consol.	100	18	18†	45⅝ — 46½	−1½	3 10 3
Do. Surplus Lands	100	2⅝	2⅝†	59 — 61	..	4 10 2
Do. 3½ % Deb.	100	3½	3½	83 — 85	..	4 2 4
Do. 3½ % Pref.	100	3½	3½	78 — 80	−1	4 7 6
Do. 3½ % Con. Pref.	100	3½	3½	77 — 79	..	4 8 7
Metropolitan District Ord.	100	Nil	..	34 — 34½	−½	Nil
Do. 6 % Deb.	100	6	6	136 — 139	..	4 6 4
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Do. 4 % Prior Lien	100	4	4	95 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	82 — 84	..	5 7 2
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	84 — 88	..	5 2 3
Do. 5 % Deb.	100	5	5	89 — 92	−1	5 8 8
Potteries, Ord.	1	3½	..	⅝ — ⅞	..	..
Do. 5 % Pref.	1	5	5	15/16 — 1 1/16	..	7 5 6
Do. 4½ % Deb.	100	4½	4½	82 — 85	..	5 6 5
South Metro. Trams, 6 % Pref.	1	6	6†	⅜ — ½	..	8 0 0
Do. 4 % Deb.	100	4	4	68 — 72	..	5 11 1
Underground Elec. Railways	10	..	..	33 — 33⅝	−⅛	Nil
Do. "A"	1/-	..	..	1/16 — 1/8	..	Nil
Do. 6% First Cum. Inc. Deb.	100	6	6	109 — 111	..	5 8 1
Do. 4½ % Bonds	100	4½	4½	99 — 101	..	4 9 1
Do. 6 % Income	100	6	6	89½ — 90½	−1	6 12 7
Yorkshire (West Riding), Ord.	5	Nil	..	⅛ — ¼	..	Nil
Do. 6 % Pref.	5	3	1½†	3⅜ — 3⅝	..	..
Do. 4½ % Deb.	100	4½	4½	81 — 85	..	5 6 0

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4 11/16 — 4 15/16	..	5 11 4
Do. 2nd Pref.	5	5½	5½	4⅝ — 4⅞	..	5 18 11
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Do. 4½ % Deb.	100	4½	4½	96 — 98	..	4 11 10
Do. 5 % Deb.	100	5	5	98½ — 100½	+ ⅛	4 19 6
Auckland Trams, 5 % Deb.	100	5	5	100 — 102	..	4 18 0
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11⅛	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	94 — 96	..	4 13 9
Do. 5 % 2nd Deb.	100	5	5	96 — 99	..	5 1 0
Brazilian Traction Light and Power	$100	6	6†	97 — 98	+ 1½	6 2 5
Brisbane Trams Invt., Ord.	5	8	8†	7⅛ — 7⅜	..	5 5 0
Do. 5 % Pref.	5	5	5	4⅜ — 5⅛	..	4 8 11
Do. 4½ % Deb.	100	4½	4½	99 — 102	..	4 8 3
B. Columbia Elec. Rly., Def.	100	8	8†	125 — 128	−1	6 5 0
Do. Pref. Ord.	100	6	6	113 — 116	+1	5 3 5
Do. 5 % Pref.	100	5	5	102½ — 105½	..	4 14 9
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 — 103	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	100 — 102	..	4 8 8
Do. 4½ % Con. Deb.	100	4½	4½	93½ — 95½ xd	+ ½	4 9 0
Calcutta Trams, Ord.	5	7½	..	5⅝ — 6⅛	..	5 12 0
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. 4½ % Deb.	100	4½	4½	96 — 99	..	4 11 0
Cape Electric Trams	1	5	..	1 1/16 — 1 1/8	..	6 8 1
City Buenos Aires Trams (1904)	5	5†	5	5 3/8 — 5 5/8	..	4 9 11
Do. 4 % Deb.	100	4	4	92 — 97	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	90½ — 94½	..	5 5 10
Havana Elec. Rly., 5 % Bonds	$1000	5	5	94½ — 98½	..	5 1 6
Kalgoorlie Elec. Trams	1	Nil	..	3/16 — 5/16	..	Nil
Do. 5 % A Deb.	100	5	5	85 — 90	..	5 11 1
Do. 6 % B Deb.	100	3	..	25 — 35	..	..
La Plata Elec. Trms, Ord.	1	..	..	13/16 — 17/16	..	..
Do. Pref.	1	4/8d.	6	13/16 — 1 3/16	..	5 16 6
Lisbon Elec. Trams, Ord.	1	6	6†	1 3/16 — 1 5/16	..	4 9 3
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	91 — 96	..	5 4 2
Madras Elec. Tr. 6% Cum. Pref.	5	6	6	4½ — 5⅛	..	5 17 1
" Elec. Tr. (1904), Deb.	100	5	5	101 — 103	..	4 17 1
Manaos Trams & Lt., 1st Deb.	100	5	5	87 — 89	..	5 12 4
Manila Elec. R. and Lt., Bonds	$1000	5	5	97 — 99	..	5 1 0
Mexico Trams Com.	$100	7†	7	98½ — 100½	..	6 19 4
Do. Gen. Con. 5 % Bonds	..	5	5	90½ — 92½	+1	5 8 1
Do. 6 % Bonds	100	6	6	93⅜ — 95⅜	..	6 5 8
Para Elec. Rlys. & Lt., Ord.	5	10	10†	6 — 6½	..	7 13 10
Do. 6 % Pref.	5	6	6	4⅜ — 5⅛	..	5 17 1
Do. 5 % 1st Deb.	100	5	5	98½ — 100½	..	4 19 6
Perth (W.A.) Elec. Tr., Ord.	1	5½	..	1⅜ — 1⅝	..	4 0 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	95 — 97	..	4 12 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	102 — 103	+ ½	4 17 1
Do. 5 % Mort. Bonds	100	5	5	96½ — 97½	+ 1	5 2 7
Sao Paulo Tram, Lt. and P. 5 % 1st Deb.	$500	5	5	102 — 104	..	4 16 2
Singapore Trams, 5 % Deb.	100	5	5	85 — 89	..	5 12 4
Southern El. Tr. B.A., 5 % Deb.	100	5	5	93 — 95	..	5 5 3
Un. Elec. Trams Monte Video	5	7	7	4⅝ — 5	..	7 0 0
Do. 6 % Pref.	5	6	6	4 1/16 — 5 1/16	..	5 18 7
Do. 5 % 1st Deb.	100	5	5	97 — 100	..	5 0 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	98½ — 100½ xd	..	4 9 7

MANUFACTURING COMPANIES.

Aron, Ord.	1	7	..	9/16 — 13/16	..	7 7 8
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	7 2 6
Babcock & Wilcox	1	16	..	3 1/16 — 3 3/16	..	5 0 5
Do. Pref.	1	6	6	1 1/16 — 1 1/8	..	4 3 6
British Aluminium, Ord.	1	..	..	1/16 — 1 1/16	..	..
Do. 6 % Cum. Pref.	1	6	6	1/16 — 1/8	..	6 8 0
Do. 5 % Prior Lien Debs.	100	5	5	92 — 95	..	5 5 3
Do. Deb. Stk.	100	5	5	83 — 86	..	5 16 3
B I. & Helsby Cables	5	10	..	8½ — 8⅝	+ ⅛	5 14 3
Do. Pref.	5	6	6	5⅝ — 6⅛	..	4 16 0
Do. Deb.	100	4½	4½	99 — 102	..	4 8 3
British Thomson-Houston, Deb.	100	4½	4½	93⅜ — 95⅜	..	4 14 0
British Westinghouse, Pref.	8	Nil	..	⅜ — 1 1/16	..	Nil
Do. Deb.	100	4	4	66 — 63	..	5 15 11
Do. 6 % Prior Lien	100	6	6	101 — 104	..	5 15 5
Brownett, Lindley, Ord.	1	..	..	2/- — 3/-	..	Nil
Do. Pref.	1	..	..	8/- — 8/6	..	Nil
Brush, 7 % Pref.	2	Nil	..	0 — ½	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	70½ — 75½	..	6 12 5
Do. 4½ % Deb.	100	4½	4½	85½ — 40½	..	11 2 2
Do. 4½ % Second Deb.	100	4½	4½	23 — 27	..	16 13 4
Callender's Cable	5	15	..	10⅜ — 11⅛	..	6 10 5
Do. Pref.	5	5	5	4 1/16 — 5 1/16	..	4 18 9
Do. Deb.	100	4½	4½	96 — 99	..	4 10 6
Castner-Kellner	1	20	..	33⅛ — 37⅛	+ 1/16	5 8 2
Do. Deb.	100	4½	4½	102 — 105	..	4 5 9
Crompton & Co., Deb.	100	5	..	64½ — 69½	..	8 8 0
Dick, Kerr	1	Nil	..	1/16 — 1/8	..	..
Do. Pref.	1	6	6	9/16 — 11/16	..	7 13 10
Edison & Swan, A, £8 paid	8	Nil	..	0 — ⅛	..	Nil
Do. fully paid	5	Nil	..	1⅛ — 1⅜	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	65 — 70	..	7 2 10
Electric Construction	2	5	..	1 — 1½	..	8 0 0
Do. Pref.	2	7	7	1½ — 2 1/16	..	6 15 9
Greenwood & Batley, Pref	10	7	7	6⅜ — 7½	..	9 18 2
Do. Deb.	100	5	..	92 — 94	..	5 4 2
General Electric, 6% Pref.	10	6	6	9½ — 10⅛	— ⅛	5 14 3
Do. Deb.	100	4	4	89 — 94	..	4 5 1
Henley's, Ord.	5	15	10†	12½ — 13	..	5 15 5
Do. Pref.	5	4½	4½	4½ — 5 1/16	..	4 8 11
Do. Deb.	100	4½	4½	101 — 103	..	4 7 5
India-Rubber, G. & T.	10	7½	..	12⅜ — 13⅜	..	5 9 1
Do. Pref.	10	5	5	9⅝ — 10⅜	..	4 18 9
Telegraph Construction	12	20	5†	37 — 39	..	6 3 1
Do. Deb.	100	4	4	96 — 98	+1	4 1 8
Willans & Robinson	1	Nil	..	1/16 — 1/8	..	Nil
Do. Pref.	5	Nil	..	⅛ — ¼	..	Nil
Do. Deb.	100	4	4	55 — 57	..	7 0 4

* Unless otherwise stated all shares are fully paid. † Interim dividend.

Bank rate of Discount 4½ per cent., April 17th, 1913.

THE EFFECT OF OUTER GLOBES ON THE LIFE OF METAL-FILAMENT LAMPS.

WITH the rapid increase in the use of large metal-filament lamps for street lighting in recent years, the question of the best shape and arrangement of the supports for them has come into prominence. It is still the usual practice to provide an outer additional protecting cover of glass, but, according to some tests carried out by Herr Gustaf Sunden (see *E.T.Z.*, August 28th, 1913) such a cover has a distinctly bad effect on the life of the lamp. He noticed that in a particular installation containing lamps, both with and without outer globes, those with globes became dull after a much shorter time than the others.

He therefore made the following tests on lamps obtained from various first-class makers. Some of the lamps were surrounded with heat-insulating material in a metal tube, so arranged that a steady temperature of 200° C. in the tube was reached, others burnt in the open at the room temperature of 20°, and others again

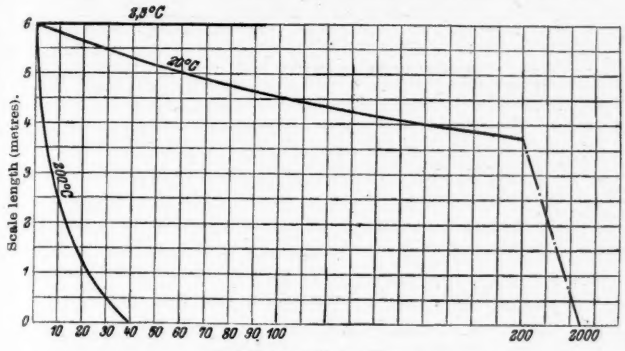


FIG. 1.

were artificially kept at 2·5° C. by a flow of cooling water. The lamps were tested from time to time for mechanical strength of filament in a shock apparatus with a 6-metre scale of the type designed by Th. Müller, of Bern. To begin with, all the lamps stood the full 6-metre test length, but this gradually diminished as the hours of burning increased, the rate of deterioration being very much more marked at the higher temperature. The results are shown in fig. 1, from which it will be seen that the 200° lamps only reached a life of 40 hours, whilst the 20° ones reached about 2,000 hours, and were even then decidedly less blackened than the others. The 2·5° C. test showed no measurable fall in brightness or in strength after 40 hours.

The probable cause of these marked differences is the diminution of the vacuum at the higher temperature through the glass becoming somewhat porous. The larger lamps, such as 300-C.P. ones, showed blackening more quickly than smaller lamps when run at the same temperature (200° C.).

The actual temperatures reached in practice are shown by a test made on a 300-C.P. lamp in an ordinary clear glass outer cover, with

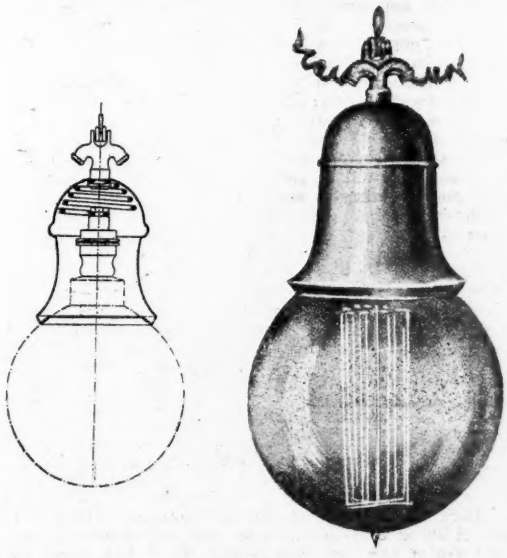


FIG. 2.

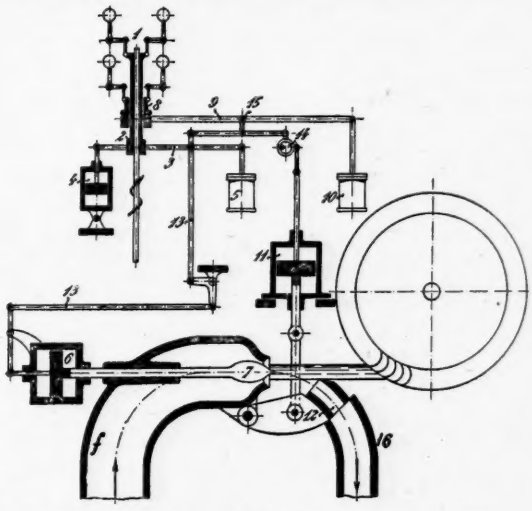
a 20-mm. opening at the bottom. The temperature inside the outer globe reached a steady value of 70° C. after 85 minutes. With an obscured or dusty globe, still higher temperatures would be reached.

In view of these results, the writer has designed the special holder shown in fig. 2 for the purpose of securely holding the lamp bulb itself, and obviating the use of any outer globe. In this design the porcelain contact holder is attached to a strong spiral spring. This spring presses the lamp bulb firmly against the wide flange of the cover. The cover is of ·6 mm. copper, and is not arranged as a reflector, since very little light is thrown upwards from the ordinary metal-filament lamp, and a reflector is, therefore, of little use. The absence of a reflector, besides cheapening the whole construction, also obviates the cleaning of the lamps, as they become automatically cleaned by the rain.

AN INTERESTING 3,000-H.P. PELTON WHEEL.

IN the Arniberg (Amsteg) hydro-electric station, a 3,000-H.P. and a 1,300-H.P. Pelton wheel set are at present installed, and accommodation is provided for two further sets. The 3,000-H.P. set offers several interesting features. The wheel is designed to run at 630 R.P.M. under a head of 2,630 ft., and is overhung on the generator shaft. The buckets are of cast electric steel and are riveted between forged steel disks; this construction does not permit of easy renewal of individual buckets, but this is rarely, if ever, necessary since the water (initially clear) is passed through a settling basin before use, hence wear on the buckets is uniform. The water jet driving the wheel is 60 mm. in diameter, and exerts a circumferential force of 8,800 lb. At normal speed, each blade receives 10 impulses per second.

Referring to the accompanying sketch, the supply main is of cast-steel 300 mm. internal diameter, and has an easily detachable delivery nozzle. Since sudden load variations (barring occasional short circuits) have not to be contended with, auxiliary fly-wheels are not used. It was specified that sudden complete removal of full load should not be followed by more than 8 per cent. rise in speed, and to comply with this requirement, a special system of automatic



regulation is employed for the first time. Abrupt diminution of the water-flow in the 1·4 miles of supply mains is, of course, impossible, owing to the serious water hammer which would result. In the arrangement actually employed, the jet is more or less completely diverted from the turbine wheel after sudden load reduction, by the temporary interposition of a curved guide tube 12 (fig. 1) between the delivery nozzle and the wheel buckets.

The double spring governor 1 is driven from the turbine shaft, and carries two sleeves, the lower one, 2, of which is connected to the lever 3 controlling, by means of the valve 5, and the auxiliary 6, the setting of the jet regulator 7. The oil dash-pot 4 prevents rapid motion of this mechanism (and hence rapid checking of the water column in the supply pipes). The upper governor sleeve 8 controls the valve 10 of the auxiliary 11, and hence the setting of the deflecting tube 12.

On small load variations, the oil-braking is hardly operative, so that the two governor sleeves move with equal speed. The section of the jet is reduced, and 12 only moves so as to follow this diminution in section without cutting into the jet. Should a large fraction of the load be removed suddenly, sleeve 8 rises at once, and part of the water jet is deflected into 16, after which the guide tube 12 gradually reverts to its original position, as 7 is closed (slowly, owing to the powerful resistance offered by 4 to rapid movement of 3). Rarely more than 10 seconds elapse before the jet is reduced to the size required by the load now carried, and the blade of the diverter 12 again lies tangential to the jet. Only during this short period does wastage of water occur, unless, of course, some obstruction should prevent the nozzle needle reaching the required position, in which case water would be deflected during the whole of the light-load period and the wheel speed would be kept constant.

TRADE STATISTICS OF NEWFOUNDLAND.

The following statement of the imports of electrical and similar materials into Newfoundland is taken from the recently issued annual trade statistics for the year ended June 30th, 1912; figures for 1910-11 are added for purposes of comparison, and notes of any increases or decreases are given :—

Dollar = 4s. 2d.

	1910-11. Dollars.	1911-12. Dollars.	*Inc. or dec.* Dollars.
Belting.—			
From United Kingdom ...	3,000	1,000	— 2,000
„ Canada	5,000	1,000	— 4,000
„ United States ...	18,000	12,000	— 6,000
Total ...	26,000	14,000	— 12,000
Gutta-percha manufactures.—			
From United Kingdom ...	9,000	19,000	+ 10,000
„ Canada	35,000	59,000	+ 24,000
„ United States ...	50,000	59,000	+ 9,000
„ Other countries ...	1,000	—	— 1,000
Total ...	95,000	137,000	+ 42,000
Iron and steel railway bars and fittings.—			
From United Kingdom ...	—	2,000	+ 2,000
„ Canada	2,000	2,000	—
„ United States ...	7,000	3,000	— 4,000
Total ...	9,000	7,000	— 2,000
Radiators, electric light material, &c.—			
From United Kingdom ...	10,000	24,000	+ 14,000
„ Canada	9,000	8,000	— 1,000
„ United States ...	46,000	36,000	— 10,000
„ Germany	1,000	—	— 1,000
Total ...	66,000	68,000	+ 2,000
Machinery for mining purposes.—			
From United Kingdom ...	51,000	44,000	— 7,000
„ Canada	142,000	148,000	+ 6,000
„ United States ...	39,000	58,000	+ 19,000
Total ...	232,000	250,000	+ 18,000
Machinery for local industries.—			
From United Kingdom ...	10,000	4,000	— 6,000
„ Canada	1,000	5,000	+ 4,000
„ United States ...	7,000	16,000	+ 9,000
Total ...	18,000	25,000	+ 7,000
Scientific instruments.—			
From United Kingdom ...	1,000	1,000	—
„ United States ...	—	1,000	+ 1,000
Total ...	1,000	2,000	+ 1,000
Goods for Anglo-American Telegraph Co.—			
From United Kingdom ...	1,000	1,000	—
„ Canada	1,000	—	— 1,000
„ United States ...	3,000	2,000	— 1,000
Total ...	5,000	3,000	— 2,000
Materials for wireless telegraphy.—			
From United Kingdom ...	6,000	4,000	— 2,000
„ United States ...	1,000	—	— 1,000
Total ...	7,000	4,000	— 3,000
Materials for Western Telegraph Co.—			
From United Kingdom ...	15,000	1,000	— 14,000
„ United States ...	1,000	—	— 1,000
Total ...	16,000	1,000	— 15,000
Material for Direct Cable Co.—			
From United Kingdom ...	18,000	1,000	— 17,000
„ Other countries ...	1,000	—	— 1,000
Total ...	19,000	1,000	— 18,000

Electric Mine Blasting.—The whole of the eighteenth level at the Meyer and Charlton mine was fired last week by the electric blasting system. There were 300 shots in the blast, which was effected from a station, only one man being required below for the firing. Cables are now placed to enable blasting to be effected from the surface. The system so far has proved satisfactory. Representatives of other mines are making inquiries with a view to its wider application.—*Daily Telegraph*

TRADE OF NEW ZEALAND.

The following are extracts from a report prepared by H.M. Trade Commissioner in New Zealand, and published by the Board of Trade, to which we refer in our leader to-day. Copies of the report are obtainable from Messrs. Wyman & Sons, the price being 3d.

Import Statistics.

Comments were made in my report for 1911 on the form of the New Zealand statistics of imports, and it was pointed out that there was reason to believe that the adoption of the country of invoicing as the basis resulted in inaccuracy and misconception. Apart from the error caused by the classification as British of a large quantity of goods which are shipped from the United Kingdom but are not of United Kingdom origin, New Zealand suffers from the added complication of receiving many of her imports from a second entrepot in Australia. It is therefore quite impossible to estimate what proportion of imports appearing in the statistics should be credited to any particular country. All who are concerned in knowing how facts stand, and who are not satisfied to accept what is merely apparent and superficial in trade matters, will welcome the legislation promised this year which will provide a correct basis for the statistics of future years.

At present the only lines of trade in which the official statistics could be taken to show, with even approximate accuracy, the actual country of origin, are those for which the tariff grants a preference to British goods; the total imports of these goods as distinct from those on which no preference is granted are therefore shown separately in the following statement of imports in 1912 :—

	Total imports.	Imports from the United Kingdom.	Percentage of imports from United Kingdom to total imports.
Goods not subject to preferential duties :—			
Machinery, cycles, motors and hardware	£2,082,349	£1,115,566	53·6 %
Total of all kinds	13,785,829	7,656,556	55·5 %
Goods imported by the Government and Cable Board (duty free)	227,040	139,118	61·3 %
Goods subject to preferential duties	6,476,752	4,346,098	67·1 %
Grand total ...	£20,976,434	£12,250,517	58·4 %

The Attitude of the Importer.

In my report of last year I referred to the fact that buyers in New Zealand show a preference for British goods. . . . This must be admitted, but there is another side to the question. I have met firms who having, as they think, been badly treated in the past, whether over agency arrangements or over shipments of bad quality goods, and having magnified their grievances into sweeping and wholesale statements against British methods of business, announce a determination to procure all future requirements from foreign countries. With these isolated instances, however, I do not propose to deal here. There is a very much more serious and more common attitude, traceable in some cases to indubitable facts, but facts of a past day. The view is widely held that British makers in certain directions need not be taken seriously. [Evidence is given of beliefs existing in New Zealand that goods which are manufactured in England of high quality cannot be procured here at all.] When views of this kind have got entrenched behind conservative instincts, nothing but an explosion will dislodge them. Preference for the known and approved article, or for the country which has first invented and perfected an article is, up to a point, only reasonable. It is, perhaps, less easy to accept as excusable the curiously wide spread ignorance as to comparative prices and their composition With the exception of importers who clear their own goods through the Customs, few people in New Zealand seem to have any idea as to what goods are dutiable and what are not. Outside their own line of business duties are not regarded as a matter of interest, and the general public, as a rule, does not concern itself with whether or not duty is included in the price of any article. The cost of commodities may be high in New Zealand, and the subject is a frequent topic for discussion, but hitherto the stress has not been sufficient to cause the average person to investigate closely the comparative prices in other countries, or the component parts of prices here.

British Trade Methods.

Charges for Extras.—I referred in my last annual report to the question of packing and the objections to treating it as an extra to be charged for separately. It cannot, I think, logically be argued that packing, which is an essential and indispensable part of the preparation of goods for delivery to the buyer, is in any sense an extra or can be so charged for. The objection to it in New Zealand is, however, not rooted in logic, but rather in prejudice. It is a point which is brought home to anyone resident in the country that extras of any kind, even if they are charges which exactly represent value received, are objectionable. The New Zealander likes an "overhead" price inclusive of everything, and is apt to consider anything extra to the original price an extortion. Whenever possible, therefore, manufacturers should be prepared to quote a price inclusive of all extras, and where extras are, as packing is, an essential part of the whole, this should be done without fail. Even where accessories are not essential, in the sense that they may

be procured separately, it is better to err on the side of including them in the price and allowing for them if not recognised. Rightly or wrongly, British manufacturers have in the past acquired a reputation for not allowing for the whims and prejudices of their customers. To those few who still afford justification for statements of this kind, it may be pointed out that prejudice on the part of the customer, while acting as a rampart against the manufacturer who would invade the market, acts also as an entrenchment for the manufacturer who has got in. It is only by humouring these prejudices, and wherever possible accepting instead of scoffing at conditions and stipulations which seem absurd, that the password to the defences may be obtained.

Manufacturers' Responsibility.—This question is referred to in our leader on this report.

Agencies.—Many firms are now represented by agents in New Zealand, but a very considerable number more have agents in Australia who cover New Zealand as well. Having in view the necessity for keeping in personal touch with the requirements of distant markets, this is no doubt very much better than having no agent at all. There are very few lines of trade, however, in which it can be shown to be preferable to having a separate agent for the Dominion. To attempt, as many agents do, to cover New South Wales, Queensland and New Zealand, or even the whole Commonwealth as well as New Zealand, has the inevitable result of superficial canvassing and a bulk of orders no bigger than would be obtained from greater concentration on smaller areas, with far less expenditure on travelling. In order to get better results, many firms allow an Australian agent to appoint sub-agents in New Zealand. The only possible justification for this would seem to lie in the fact that the head agent is financially interested in finding as sub-agent the firm who will make most sales; and further, a firm at home having an agent in Australia may find it easier to secure an agent in New Zealand through him than in any other way. On the other hand, it is difficult to see how it can be profitable to subject all business to an extra agency commission when the manufacturer could have an independent agent in New Zealand. It is to be feared that in the majority of cases firms at home do not yet realise that this Dominion has no more to do with the Commonwealth than Canada, that it is 1,200 miles distant, and that market conditions are in many respects different.

Although the above remarks may be taken to apply to stock lines such as hardware, cutlery, drapery, groceries, &c., they apply still more forcibly in regard to machinery, and there are certain lines in which this system of agency is little more than a farce. The stock lines referred to are in demand all the year round, and periodical visits to buyers may secure all the trade that is going; on the other hand, large plant of all kinds is only inquired for occasionally, and in order not to miss these occasions an agent must be on the spot, and on the look out for rumours and Press paragraphs. He must also be prepared to go and work for an order immediately he hears of a possible one. It should be obvious that a man living in another country is not usually in a position to do this. Even if he gets an order he cannot stay over here indefinitely to supervise installation and get his plant in working order. The fact of his not residing here is apt to prejudice the buyer against him, and orders from public bodies are unquestionably lost in this way. If he appoints a sub-agent his over-riding commission may lose him the order. As a matter of fact, this class of business can normally only be handled satisfactorily by having an agent on the spot and paying him a fixed fee and expenses. Offering only a commission on business that is problematical, where orders are few and far between, and where an inquiry may entail spending much time and money without business resulting—as is the case in tendering—is often quite useless. A retaining fee, paid whether there is business or not, and payment of travelling expenses, should be the agent's remuneration, with possibly a small commission in addition on business done.

Catalogues and Trade Journals.—It is disappointing, and the reason is a little difficult to understand, but the fact remains, that even after two requests through the *Board of Trade Journal* and the Press, the number of manufacturers' catalogues on my shelves is absurdly inadequate. There are few places more natural and obvious as a place of reference to catalogues than the Trade Commissioner's office, and yet it seems the very last place that occurs to the majority of manufacturers. I have on my shelves catalogues of British manufacturers which are as well got up in every respect as any I have ever seen, and I know that a very large number of firms grudge no expense in making their goods known. At the same time it remains a fact that most of these are content at present to send them to any place in New Zealand rather than to my office.

United States Competition.

The only very serious competition in imports in New Zealand comes from the United States. It must be remembered also that the route across America is becoming more and more a highway to Europe. Firms going home to get agencies are captured on the way across and are impressed by the scale of manufacture, the hustle, and the big talk, and arrive home with their mouths full and little appetite left. New Zealand has not yet learnt to hustle, but people are full of the notion that they do hustle, and are very up to date (as they are in many ways), and even though they may not admit their partiality for things American they have at least much admiration for the United States manufacturer, who is thought to be so modern and not old enough yet to have become sleepy and self-satisfied. In many lines, goods designed in the United States to suit the home market, and turned out comparatively cheaply owing to the size of that market, have been found very suitable for the not dissimilar conditions here, and as a consequence the idea has spread widely that United States manufacturers are always ready to make what customers want. As a matter of fact, adaptability to the particular whims of a very small market is less likely to be found in America than elsewhere, but the conviction to the contrary dies hard.

United States trade with New Zealand has also been helped by the tariff preference given by the New Zealand Government to Canadian goods, which is equal to that given to British goods. This has encouraged the supply of goods from Canada, and as Canadian firms, even when not branches of United States houses or dominated by United States capital, adopt the United States system of manufacture—aiming at lightness and cheapness, and entailing a lack of durability—the footing which Canadian manufacturers have been able to get in New Zealand, has broken down the prejudice against the United States system of manufacture (as contrasted with the higher finish and durability of British goods). Were the preferential duties to be cancelled, the shipments now coming from Canada would probably come direct from parent works in the United States.

Posts and Telegraphs.

The most important development is the impending installation of automatic telephones. An officer of the Post and Telegraph Department recently visited America, Germany and England, but his report dealt almost exclusively with the first-named. The system which is most favoured is being manufactured in England under the American patents, but the Australasian rights are in the hands of an Australian company not themselves manufacturing but tendering in their own name; the goods they supply are at present made in Chicago. In the past British makers have had very little share in the telephone purchases of this department.

ELECTRIC VACUUM FURNACES.

The vacuum furnace, for years employed only for laboratory and demonstration purposes, has developed into a commercial apparatus since the appearance of the metal-filament lamp. Without this furnace, it is hard to see how the tungsten filament could have been developed. The vacuum furnace is one in which material may be heated or melted *in vacuo* and, for relatively large furnaces and the attainment of high temperatures, electric heating is the only practicable agency available.

A section through an Arsen horizontal furnace, such as is used at Schenectady in the manufacture of ductile tungsten, is shown in fig. 1. The vacuum chamber is of gun-metal, and is tinned internally so as to stop all pores in the casting. Joints are fixed with lead gaskets, screwed and soldered to ensure air-tightness. An outer radiation screen minimises the heat loss by direct radiation, and water jackets are used where necessary to prevent overheating of certain parts. The heater is a resistance element of graphite, which offers the advantages of infusibility and sufficiently high resistance. The furnace being evacuated, burning of the graphite does not occur, but at 2,600° C. sublimation commences to be appreciable, and a heating unit wastes away at first slowly and then more rapidly till failure occurs at the centre point, after about nine hours' service. At 3,100° C. a heater lasts about one hour, and this is about the highest temperature which can be reached in this type of furnace. Up to 2,000° C. (3,630° F.) a graphite heater will last almost indefinitely. Replacement of heaters is a simple and inexpensive matter.

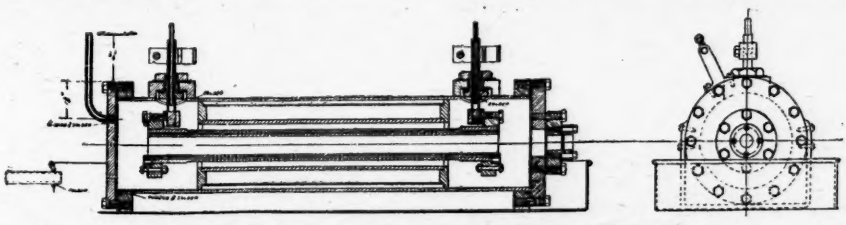


Fig. 1.—Section and End Elevation of Vacuum Furnace.

For laboratory use in the preparation of refractory alloys and compounds, the refining of refractory materials, calibration of pyrometers and general high-temperature work, a small vertical

furnace accommodating a 1½-in. diameter × 4-in. crucible is convenient. A large vertical furnace used for research work at Schenectady accommodates a crucible 4 in. in diameter × 10 in. high, and a box-type vacuum furnace taking a crucible 4 in. × 8 in. × 12 in. is arranged on the same general principle. A mica inspection port enables the operator to watch the progress of changes within the crucible. To evacuate these furnaces, double-cylinder Geryck and three-cylinder Peckard pumps are employed.

Similar furnaces have been installed by several technical colleges and standardising institutions in the States. The advantages offered by these, as compared with other types of laboratory furnaces, include the possibility of treating comparatively large quantities of material at very high temperatures. Heating *in vacuo* not only prevents oxidation and absorption of nitrogen, &c., but also removes any gases occluded during previous treatment of the material concerned.

APPARATUS ON HIRE.

By T. C. PARSONS.

(*Continued from page* 438.)

Application Forms.—Suggested forms, which the writer used in Govan, are appended. The clause with regard to the landlord's hypothec for rent is applicable in Scotland, but the writer does not know whether it is so in England.

G.C.E.D.

MOTOR ON HIRE (Outward).

MOTOR Corp. No. .... Maker ..... Maker's No. ....
H.P. ..... Speed ..... Voltage .....
STARTER Corp. No. .... Maker ..... Maker's No. ....
D.P. SWITCH Corp. No. .... Maker ..... Size .....
FUSES. Size ..... Maker .....

G.C.E.D.

Motor Equipment detailed on reverse side.

Installed at Name .....
Address .....
Date .....
(Signed) .....
Motor Superintendent.

Entered in Valuation Book and Hirers' Register. .....
(Signed) .....

Motor outward card to be filled in by Motor Superintendent and sent to head office.

G.C.E.D.

MOTOR ON HIRE (Inward).

MOTOR Corp. No. .... Maker ..... Maker's No. ....
H.P. ..... Speed ..... Voltage .....
STARTER Corp. No. .... Maker ..... Maker's No. ....
D.P. SWITCH Corp. No. .... Maker ..... Size .....
FUSES. Size ..... Maker .....

G.C.E.D.

Motor Equipment detailed on reverse side.

Brought in from Name .....
Address .....
Date .....
(Signed) .....
Motor Superintendent.

Entered in Valuation Book and marked off in Hirers' Register. .....
(Signed) .....

Motor inward card to be filled in by Motor Superintendent and sent to head office.

BURGH OF GOVAN ELECTRICITY DEPARTMENT.

Electricity Works, Helen Street, Govan.

APPLICATION FORM FOR HIRE OF MOTORS.

I (We) ..... desire to hire from the Corporation of Govan, Electric Motors of the following sizes and rentals :—

Motors.		Rent per annum.	Slide Rails.	
No.	H.P.		No.	Rent per annum.

for use at my (our) premises situate at ..... and I (we) undertake to pay for the hire of the motors at the above rates, and for any repairs due to negligence or overloading, and to insure the apparatus against fire for the sum of ....., and to observe the conditions attached hereto, to which I (we) have placed my (our) signature, and a copy of which remains in (my) our possession, and to sign (if required) an agreement to this effect, to be drawn up by the Town Clerk.

Dated this ..... day of ....., 191...

Hirer's Signature .....
Address .....

Conditions.

1. The hirer must agree to take the motor for a period of not less than 12 months.
2. The rent is due quarterly, and MUST BE PAID IN ADVANCE, the first payment to be made before the motor is connected. In the event of the amount for hire, current consumed, or any repairs that may have been executed, becoming overdue, the CURRENT WILL BE CUT OFF.
3. The rent includes starting gear, but all other accessories, such as spare brushes, oil, special pulleys, &c., must be paid for in advance.

A small charge is made for fixing the motors, as per scale below :

Size of motor.	Charge for fixing.
1—7 H.P.	... 7s. 6d.
8—15 H.P.	... 10s. 0d.
16—20 H.P.	... 15s. 0d.
21—35 H.P.	... 20s. 0d.

4. The hirer to provide the necessary foundations.
5. Only oil to be obtained from this Department must be used on the bearings, for which 1s. 8d. per gallon will be charged, which must be paid in advance.
6. Only brushes obtained from this Department must be used, and they must be fixed by the Corporation Inspector. A charge of 1s. per brush will be made.
7. The hirer to provide a double-pole switch and two single-pole fuses near the meter, and the wiring from the meter to the motor.
8. The hirer to pay for any damage done to the motor or starting gear due to fire, negligence or overloading.
9. If required by the Town Council, the hirer shall enter into a stamped agreement with them, embodying the terms of the hire of the motor.
10. The motor not to be loaded above its rated capacity.
11. No motor or fittings belonging to the Town Council shall be subject to the landlord's hypothec for rent, or be liable to be taken in execution under any diligence, or any process of Court, or by any proceedings in cessio or bankruptcy against any person in whose possession the same may be, as provided in the Govan Electric Lighting (Further Powers) Act, 1904.

(Signed) Theodore C. Parsons,
Burgh Electrical Engineer.

Hirer's Signature .....
Address .....

This part to be retained by the Hirer.

BURGH OF GOVAN ELECTRICITY DEPARTMENT.

Particulars Relating to the Hire of Electric Motors.

The Burgh of Govan are prepared to let out on hire electric motors of 1 H.P. and upwards upon the conditions stated below :—

1. The hirer must agree to take the motor for a period of not less than 12 months.
2. The rent is due quarterly, and MUST BE PAID IN ADVANCE, the first payment to be made before the motor is connected. In the event of the amount for hire, current consumed, or any repairs that may have been executed, becoming overdue, THE CURRENT WILL BE CUT OFF.
3. The rent, which is given APPROXIMATELY for the different sizes of shunt-wound semi-enclosed motors in the following table, includes starting gear, but all other accessories, such as spare

brushes, oil, special pulleys, &c., must be paid for in advance. Special prices given for totally enclosed motors.

Size of motor in B.H.P.	Voltage.	Standard pulley. Dia.	Face.	Speed.	Rent of motor per annum.	Rent of rails per annum.
		In.	In.	R.P.M.	£ s. d.	
1	250	3¾	3	1,400	2 0 0	2s.
1·3	,,	5	4	640	2 8 0	2s.
2	,,	4½	3½	1,350	2 4 0	2s.
2·4	,,	5	4	900	2 12 0	2s.
3	,,	5	4	1,400	2 10 0	2s.
3·5	,,	6	4½	725	3 2 0	2s.
5·25	500	9	6	815	4 10 0	4s.
5	,,	9	6	470	5 0 0	4s.
7	,,	9	6	690	5 4 0	4s.
7·25	,,	12	7	435	6 2 0	4s.
11	,,	9	6	990	5 6 0	4s
11·5	,,	12	7	630	6 4 0	4s.
11	,,	12	7	470	6 16 0	4s.
15	,,	12	7	790	6 6 0	4s.
16	,,	14	8	550	8 0 0	6s.
20	,,	14	8	700	8 10 0	6s.
20	,,	15	10	530	10 6 0	6s.
27	,,	14	8	950	8 14 0	6s.
27·5	,,	15	10	550	11 10 0	6s.
30	,,	15	10	805	10 12 0	6s.
30	,,	18	12	480	13 12 0	8s.
35	,,	18	12	540	13 16 0	8s.
35	,,	18	12	430	15 12 0	8s.

A small charge is also made for fixing the motor, as per scale below :—

Size of motor.	Charge for fixing.
1—7 H.P.	... 7s. 6d.
8—15 H.P.	... 10s. 0d.
16—20 H.P.	... 15s. 0d.
21—35 H.P.	... 20s. 0d.

4. The hirer to provide the necessary foundations.
5. Only oil to be obtained from this Department must be used on the bearings, for which 1s. 8d. per gallon will be charged, which must be paid in advance.
6. Only brushes obtained from this Department must be used, and they must be fixed by the Corporation inspector. A charge of 1s. per brush will be made.
7. The hirer to provide a double-pole switch and two single-pole fuses near the meter, and the wiring from the meter to the motor.
8. The hirer to pay for any damage done to the motor or starting gear due to fire, negligence or overloading.
9. If required by the Town Council, the hirer shall enter into a stamped agreement with them, embodying the terms of the hire of the motor.
10. The motor not to be loaded above its rated capacity.
11. No motor or fittings belonging to the Town Council shall be subject to the landlord's hypothec for rent, or be liable to be taken in execution under any diligence or any process of Court, or by any proceedings in cessio or bankruptcy against any person in whose possession the same may be, as provided in the Govan Electric Lighting (Further Powers) Act, 1904.

(Signed) THEODORE C. PARSONS,
Burgh Electrical Engineer.

Hirer's Signature .....

Address .....

BURGH OF GOVAN ELECTRICITY DEPARTMENT.

ELECTRICITY WORKS, HELEN STREET, GOVAN.

APPLICATION FORM FOR HIRE-PURCHASE OF MOTORS.

I (We) ..... desire to purchase from the Corporation of Govan, Electric Motors of the following sizes, and to pay for the same in ..... quarterly payments as given below :—

Motors. No.	Motors. H.P.	No. of quarterly payments.	Amount of each payment.

for use at my (our) premises situate at ..... and I (we) undertake to pay for the hire of the motors at the above rates, and for any repairs due to negligence or overloading, and to insure against fire for the sum of ....., and to observe the conditions attached hereto, to which I (we) have placed my (our) signature, and a copy of which remains in my (our) possession, and to sign (if required) an agreement to this effect, to be drawn up by the Town Clerk.

Dated this ..... day of ....., 191...

Hirer's Signature .....

Address .....

CONDITIONS.

1. The rent is due quarterly, and MUST BE PAID IN ADVANCE the first payment to be made before the motor is connected. In the event of the amount for hire, current consumed or any repairs that may have been executed, becoming overdue, the CURRENT WILL BE CUT OFF.
2. The rent includes starting gear, but all other accessories, such as spare brushes, oil, special pulleys, &c., must be paid for in advance.

A small charge is made for fixing the motors, as per scale below :—

Size of motor.	Charge for fixing.
1—7 H.P.	... 7s. 6d.
8—15 H.P.	... 10s. 0d.
16—20 H.P.	... 15s. 0d.
21—35 H.P.	... 20s. 0d.

3. The hirer to provide the necessary foundations.
4. Only oil to be obtained from this Department must be used on the bearings, for which 1s. 8d. per gallon will be charged, which must be paid in advance.
5. Only brushes obtained from this Department must be used, and they must be fixed by the Corporation inspector. A charge of 1s. per brush will be made.
6. The hirer to provide a double-pole switch and two single-pole fuses near the meter, and the wiring from the meter to the motor.
7. The hirer to pay for any damage done to the motor or starting gear due to fire, negligence or overloading.
8. If required by the Town Council, the hirer shall enter into a stamped agreement with them, embodying the terms of the hire of the motor.
9. The motor not to be loaded above its rated capacity.
10. Until the purchase is completed, the motor and equipment to remain the property of the Corporation, and the hirer must not sell, remove or alter the motor or equipment without the consent, in writing, of the Corporation.
11. No motor or fittings belonging to the Town Council shall be subject to the landlord's hypothec for rent, or be liable to be taken in execution under any diligence, or any process of Court, or by any proceedings in cessio or bankruptcy against any person in whose possession the same may be, as provided in the Govan Electric Lighting (Further Powers) Act, 1904.

(Signed) THEODORE C. PARSONS,
Burgh Electrical Engineer.

Hirer's Signature .....

Address .....

This part to be retained by the Hirer.

BURGH OF GOVAN ELECTRICITY DEPARTMENT.

Particulars relating to the Hire-Purchase of Electric Motors.

THE Burgh of Govan are prepared to let out on hire-purchase electric motors of 1 H.P. and upwards upon the conditions stated below :—

1. The rent is due quarterly and MUST BE PAID IN ADVANCE, the first payment to be made before the motor is connected. In the event of the amount for hire, current consumed, or any repairs that may have executed, becoming overdue, THE CURRENT WILL BE CUT OFF.
2. The rent, which is given APPROXIMATELY for the different sizes of shunt-wound semi-enclosed motors in the following table, includes starting gear, but all other accessories, such as spare brushes, oil, special pulleys, &c., must be paid for in advance. Special prices given for totally enclosed motors.

Size of motor in B.H.P.	Voltage.	Standard pulley. Dia.	Face	Speed.	Quarterly instalments for hire-purchase of motor, starting gear and rails. 1 year.	2 years.	3 years.	4 years.	5 years.
		In.	In.	R.P.M.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	250	3¾	3	1,400	3 8 3	1 16 8	1 6 4	1 0 10	17 8
1·3	,,	5	4	640	4 15 2	2 11 3	1 16 8	1 9 2	1 4 9
2	,,	4½	3½	1,350	4 8 2	2 7 5	1 14 0	1 7 0	1 2 10
2·4	,,	5	4	900	5 2 10	2 15 7	1 19 7	1 11 5	1 6 7
3	,,	5	4	1,400	4 18 0	2 12 7	1 17 8	1 9 10	1 5 5
3·5	,,	6	4½	725	6 2 0	3 5 5	2 6 10	1 17 4	1 11 7
5·25	500	9	6	815	9 0 0	4 16 8	3 9 2	2 14 9	2 6 7
5	,,	9	6	470	10 2 0	5 8 9	3 18 0	3 1 9	2 12 7
7	,,	9	6	690	10 10 0	5 11 9	4 0 0	3 3 7	2 14 0
7·25	,,	12	7	435	12 0 0	6 9 2	4 12 9	3 13 7	3 2 4
11	,,	9	6	990	10 12 4	5 14 4	4 2 0	3 5 0	2 15 2
11·5	,,	12	7	630	12 8 0	6 13 4	4 15 7	3 16 0	3 4 4
11	,,	12	7	470	13 10 0	7 5 4	5 4 2	4 2 9	3 10 6
15	,,	12	7	790	12 10 0	6 14 2	4 16 2	3 16 4	3 4 9
16	,,	14	8	550	16 3 0	8 12 6	6 3 9	4 18 6	4 3 2
20	,,	14	8	700	16 18 0	9 2 0	6 10 0	5 3 2	4 7 7
20	,,	15	10	530	20 8 0	11 0 0	7 17 4	6 5 0	5 6 0
27	,,	14	8	950	17 5 0	9 6 0	6 13 0	5 5 2	4 9 6
27·5	,,	15	10	550	22 12 0	12 3 0	8 14 9	6 18 0	5 17 2
30	,,	15	10	805	21 0 6	11 6 0	8 2 0	6 9 0	5 9 0
30	,,	18	12	480	27 4 0	14 12 0	10 9 0	8 6 0	7 1 0
35	,,	18	12	540	27 8 0	14 15 0	10 11 6	8 7 6	7 2 6
35	,,	18	12	430	31 0 0	16 12 0	11 18 0	9 9 0	8 0 6

A small charge is also made for fixing the motor, as per scale below :—

Size of motor.	Charge for fixing.
1—7 H.P.	... 7s. 6d.
8—15 H.P.	... 10s. 0d.
16—20 H.P.	... 15s. 0d.
21—35 H.P.	... 20s. 0d.

3. The hirer to provide the necessary foundations.
4. Only oil to be obtained from this Department must be used on the bearings, for which 1s. 8d. per gallon will be charged, and which must be paid in advance.
5. Only brushes obtained from this Department must be used, and they must be fixed by the Corporation inspector. A charge of 1s. per brush will be made.
6. The hirer to provide a double-pole switch and two single-pole fuses near the meter, and the wiring from the meter to the motor.
7. The hirer to pay for any damage done to the motor or starting gear due to fire, negligence or overloading.
8. If required by the Town Council, the hirer shall enter into a stamped agreement with them, embodying the terms of the hire of the motor.
9. The motor not to be loaded above its rated capacity.
10. Until the purchase is completed, the motor and equipment to remain the property of the Corporation, and the hirer must not sell, remove or alter the motor or equipment without the consent in writing of the Corporation.
11. No motor or fittings belonging to the Town Council shall be subject to the landlord's hypothec for rent, or be liable to be taken in execution under any diligence or any process of Court, or by any proceedings in cessio or bankruptcy against any person in whose possession the same may be, as provided in the Govan Electric Lighting (Further Powers) Act, 1904.

(Signed) Theodore C. Parsons,
Burgh Electrical Engineer.

Hirer's Signature .....

Address .....

The rentals shown are approximately those for standard shunt-wound semi-enclosed motors, ironclad switches, fuses and starters, all of first-class make, at prices prevailing in 1912. The charges would be slightly higher for compound-wound, and considerably higher for totally-enclosed or pipe-ventilated motors, special prices for which can be given on application.

Cards.—When a motor has been installed, a "Motor Outwards" card is filled in by the motor superintendent and sent up to the head office, and the entry is made there in the Motor Valuation Book and in the card or loose-leaf register. A similar procedure takes place when a motor is removed from a hirer's premises. Suggested forms of cards, which might with advantage be printed in different colours, are given on p. 474.

(To be continued.)

REVIEWS.

High and Low-Tension Switchgear Design. By A. G. Collis. London : Constable & Co. Price 10s. 6d. net.

The literature of electrical engineering is not over-burdened with works dealing with switchgear, and the present work, which has been compiled with the object of giving the result of researches made for the purpose of obtaining accurate data as to the effects of opening and closing electric circuits, is welcome.

The larger portion of the book is expressly intended only as an introduction to the main elements of design, and the subject is treated in such a manner that the essentials may be easily understood by those interested in this class of apparatus.

The scheme of the volume is such that the first four chapters forming Part I deal with alternating-current switchgear, while direct-current apparatus is treated in Part II, also consisting of four chapters.

Chapter I is partly introductory, and deals with switchgear for high-pressure service, the problem of sectionalising, colliery switchgear and the like, the treatment being clear and concise. The author is very severe on manufacturers. After describing the difficulty he had to overcome to make experiments in connection with the subject, he states that : "The tendency is to copy one or another's manufacture, incorporating their particular ideas, whereas design should be primarily based on principles derived from accurate data. Insensate competition and the controlling interest of those who rule the industry and have no intimate knowledge of technique are responsible for the features."

The vital subject of oil-switch design is considered in Chapter II. There is a short account of internal and external reactance in alternators, and the effect thereof on the controlling switchgear. The author does not advise the use of external reactance, as, in his opinion, the safeguard secured in this manner introduces greater evils into the system, which are detrimental to the continuity of supply. This is, of course, in direct opposition to modern American ideas. A number of interesting oscillograph records of short circuits in large systems are given, illustrating the very high rate of current rise incurred, &c. Some information—of a rather scrappy character, however—is given regarding corona phenomena, surges, oscillations, &c.

Chapter III is devoted to the discussion of apparatus for protecting alternating-current circuits, &c. Two formulæ are given on page 85, but the meaning of the symbols used is not specified. These refer to the induced E.M.F. of generators and transformers, and while, of course, they are easily understood by the initiated, the omission to make their meaning clear cannot be commended. A number of connection diagrams are given, some of which are valuable, while others are of the most elementary character.

The concluding chapter of the alternating-current section deals with the measurement of output, and a large number of methods of connecting wattmeters to various types of circuit are given. Some interesting curves illustrating the accuracy, or, rather, the want of accuracy, in wattmeters are a happy feature. Ammeters and voltmeters are briefly treated, together with some other subjects only remotely related to switchgear.

Chapter V, the opening one of the direct-current section, deals with the precautions and the protective apparatus necessary for the paralleling of generators, circuit-breakers, porcelain fuse tests, &c. A considerable number of reproductions from oscillograph tests are included, which, as the author says, repay the difficulty and inconvenience of obtaining them, as the result is beyond dispute.

In Chapter VI we have a brief survey of air-break switches, diagrams of generator and motor-generator panels, and so on. We are glad to see that the author is opposed to the old-fashioned idea of not using the hinge of a knife-switch for current-carrying purposes.

The requirements of switches for mining work, equipment of booster panels, connection diagrams of controllers and the calculation of the resistances for motor starters are discussed in the succeeding chapter, together with some alternating-current work and tables. The treatment is too brief to be of much use to a beginner, in several instances.

The greater part of Chapter VIII deals with subjects quite foreign to direct-current switchgear. For example, we have dissertations on power factor, rotary converters, three-phase transformation, synchronous motors, &c.

The Board of Trade electricity regulations are added as an appendix.

The few misprints that appear are not important, and are quite easily detected. The book abounds with practical "tips," and contains a good deal of original work. The style, however, is somewhat scrappy, and the price appears somewhat stiff for a book which consists of only 205 pages, and is intended to appeal to "the great body of engineers and artisans in all departments of electrical engineering practice."—H. G. S.

Electricity for the Farm and Home. By Frank Koester. 1913. New York : Sturgis & Walton Co. Price $1.0 net.

This book is especially addressed to the American farmer, who will no doubt find it useful in keeping him *au fait* with what has already been done in the way of applying electricity about the farm and homestead. Both examples and illustrations are confined to farms in America and Germany, where the conditions differ somewhat from those obtaining in this country; at the same time much of the practice

described is applicable over here and, in any case, it behoves British agriculturists to keep in touch with the latest developments abroad. What are often referred to as "farms" by the author would be known as large estates in this country, and these are the only examples given of the private generation of electricity for power and lighting. For the smaller farms, it is assumed that current is derived from public mains, or that a number of farmers share a generating station between them.

What appears to make the conditions more favourable to the use of electricity in Germany than in this country is the number of special industries carried on by the farmer, which demand power. For instance:—Beet, potato and other leaves are artificially dried for cattle food, while potatoes themselves are similarly treated, or used in the manufacture of alcohol, starch and potato flour. These agricultural industries make the generation and distribution of electricity a commercial success where similar ventures would fail in English rural districts.

A good deal of instruction and information as regards the details of various types of installation might very well have been omitted, as the reader is frequently urged to employ an expert engineer, who presumably would be well versed in these matters. For example, a table is given in which the losses in B.TH.U. per lb. of coal are analysed for a high-class steam-driven plant, and we are given further on full details of the devices for insulating storage battery cells. Yet the instructions are not nearly complete enough to enable a reader to choose a suitable plant for himself, and install it in the best possible manner. Failing a more popular work, this book may serve to interest the British farmer in the subject, and it contains a good deal of information which should prove useful to electrical engineers specialising in agricultural applications. At the same time, a much more convincing and easily understood book will be needed to cause a clamour amongst the farmers of this country for supplies of electricity.

We believe that in the long run electricity will be used wherever power, light or heat is required, but owing to the peculiar conditions under which it is carried on, the farming industry is likely to form one of the last strongholds of the oil engine.

An instance may be given of a farm of about 400 acres (quite an average size) where a 6-H.P. paraffin engine prepares fodder for 40 horses and cattle, besides a number of sheep. Only about 3 H.P. is really needed, and oil averages 2s. 6d. a week, which does not offer much scope for economy from electricity or any other form of power. On the other hand, if public supplies of electricity were within reach, farmers would assuredly adopt electric power and light if only on account of their safety and convenience. The smaller farmers could still hire threshing tackle as they do now, but the engine would be replaced by a suitable motor.

Electrical labour-saving appliances would not be of much value to farmers under the present conditions, but the industrial unrest is extending to farm labourers, and by the time public supplies are available, the farmer will be as anxious to save hand labour as any other employer.

THE "HAND" OF AN ARMATURE.

By HUMPHRY MacCALLUM, B.Sc., A.M.I.C.E.

In the opinion of the writer, it is eminently desirable that there should be a definite and universally accepted meaning to the terms "right-handed" and "left-handed" as applied to armature windings of the usual drum type; but whereas the leading authors agree upon this point when the obsolete "ring" is under discussion—see fig. 1—it will be found that in many books no reference is made to the "hand" of the modern drum armature, and where the point is dealt with the definitions given are frequently out of date and of doubtful value.

As an example, the following appears in one of the best of modern text-books:—

"In every symmetrical drum, without exception, the rule for finding the hand of the system may be more simply expressed by saying that the winding must be traced from a sector down the path which, at the commutator end, lies nearest to the armature core, *i.e.*, from the commutator end down to the lower arm of the barrel-wound loop, or down the end connector to a short bar in the armature with involute end connections. If we are then led to touch at the

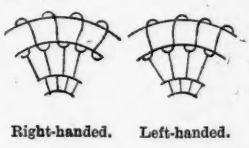


FIG. 1.—RING ARMATURE WINDINGS.

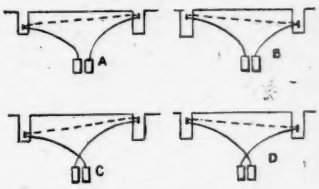


FIG. 2.—DRUM ARMATURE WINDINGS.

sectors adjacent to our starting point in a clockwise direction, the system is right-handed, or in a counter-clockwise direction, it is left-handed."

In other words, armatures which are built up of coils A or D, fig. 2, will be right-handed, and those which are built up of coils such as B or C will be left-handed.

In actual practice the difference between A and B or between C and D lies only in the shape of the coil as determined by the way it is "spread" or opened out before mounting on the core, and complete armatures built from either kind of coil, but having the same number of conductors, will be perfectly interchangeable. On the other

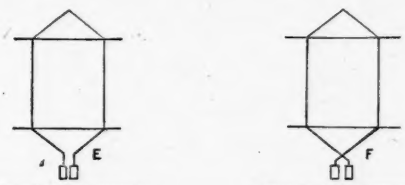


FIG. 3.—ONE SECTION OF A PARALLEL WINDING.

hand, those armatures which, according to the above definition, are of the same "hand," will not be interchangeable, for if run in the same magnet systems they will give opposite directions of rotation.

For this reason the above method of classification must be regarded as unsatisfactory, and it would appear more logical to reserve the terms right and left hand as in the following definitions, for the purpose of distinguishing between those armatures which, under similar conditions, give opposite directions of rotation.

Right-handed armatures are those in which the positive brushes are opposite the N poles of the field magnet when the direction of rotation is clockwise when viewed from the commutator end.

Left-handed armatures are those in which the positive brushes are opposite the N poles of the field magnet when the direction of rotation is counter-clockwise when viewed from the commutator end.

Under such a system all lap-wound armatures built up of coils similar to A and B (fig. 2), or E (fig. 3), will be "left-handed," and those built up of coils C and D (fig. 2), or F (fig. 3), will be "right-handed."

An important advantage of this method of classification is that it applies equally well to the series or the parallel armature (see fig. 4). The essential difference between the two hands in either case is that in the "right-hand" coupling the coil ends or the ends of a "round" cross one another, whereas in the "left-hand" coupling they do not cross, a distinction which gives rise to the following perfectly definite rules:—

1. In all lap or parallel-wound drum armatures if the ends of a section cross one another, the winding is "right-handed," but if they do not cross it is "left-handed."

2. In all wave or series-wound drum armatures, if the

ends of a complete round, consisting of $p/2$ sections, cross one another, the winding is "right-handed," and if they do not cross it is "left-handed."

In the case of the wave-wound armature a further distinction between the two "hands" results from the fact that the number of active conductors z must comply with one or other of the following formulæ :—

$$(a)\ z = p\,y - c \qquad (b)\ z = p\,y + c$$

p = number of poles.
y = average winding step.
c = number of circuits.

Formula (a) gives a winding in which the ends of the rounds cross, and which is, therefore, "right-handed," while formula (b) corresponds to a winding in which the ends do not cross, and therefore to a "left-handed" winding.

Objection may be taken to the use of the terms "right hand" and "left hand" on the ground that, in the case of the modern drum armature at any rate, they are of an empirical nature, and have no obvious connection with right-handed or left-handed motion. It will be noticed, however, that in the case of all windings (lap or wave) which are right-handed in accordance with the above system of classification, if a start be made at any com-plate and the winding be followed to the right it will be found to progress to the right, and if a start be made to the left the progress will be to the left. That is to say, a right-handed winding progresses in the same direction as the start. In the case of left-hand windings the opposite holds good, so that the terms "progressive" winding and "retrogressive" winding, which have been suggested by Messrs. Sheldon and Hausmann ("Dynamo-Electric Machinery," page 57, Crosby Lockwood) are alternatives respectively to the more usual "right-handed" and "left-handed" winding.

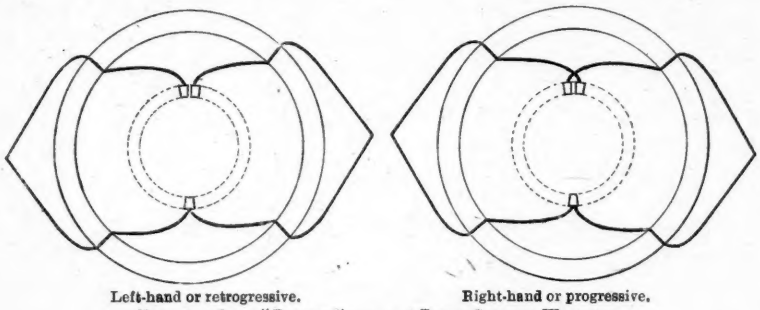


Fig. 4.—One "Round" of a 4-Pole Series Winding.

AISGILL REFLECTIONS.

I.—Continental Railways and Electric Lighting.

Since the Aisgill disaster, numerous suggestions for the avoidance of railway accidents have appeared in the correspondence columns of the daily newspapers and also in the technical Press. Comparisons have also been made between British company-owned and Continental State-owned railways, with a view to showing that on State railways the question of cost is not allowed to stand in the way when the safety of the travelling public is concerned. There may be a germ of truth in this, as a company must of course consider the question of cost, seeing that they have not a free hand in the imposition of passenger fares ; but, on the other hand, no company engaged in a competitive business can afford to ignore its customers' interests.

Seeing that the question of State control has been raised, it will be interesting to look into the past records of foreign railways, when it will be seen that the gas lighting of coaches has been as disastrous on the Continent as in this country, and the records furnish additional arguments for the entire abolition of gas on British railways.

The danger of gas-lighted trains was brought prominently before the German Government early in 1901, when in a terrible railway accident at Offenbach several persons lost their lives owing to the coaches being set on fire by escaping gas. Herr von Thielen, the Railway Minister at the time, stated, during a discussion in the Lower Chamber of the Prussian Diet, that a completely practicable system of electric lighting for trains did not exist, but that when such a method was available, the authorities would provide £2,500,000 which would be needed to effect the substitution of electric light for gas. Trials were subsequently made on the Berlin-Stettin trains with steam turbo-dynamos fixed on the locomotives to supply light throughout the train, and here we would remark that as far back as 1884—17 years before the German experiments—trains were running in England, between Liverpool and Manchester, equipped with an almost identical system, the only difference being that a Tower spherical engine was used instead of a steam turbine.

What was the precise result of the German experiments we cannot say, but six years later, when an accident similar to the Offenbach disaster occurred at Strausberg in 1907, the dangers of gas lighting were again brought forcibly to the front. On this occasion one coach—the mail coach—was electrically lighted, and it is noteworthy that, in contradistinction to the others which were gas-lighted and caught fire, the mail van, although badly smashed, did not ignite. In fact, and this also is important, one of the lamps continued to burn after the accident, and facilitated the work of rescuing the postal officials. The experience parallels that of the Catesby tunnel accident of 1906, when, as pointed out in our last issue, the only carriage which remained lighted and facilitated rescue operations was an electrically-lighted carriage. What becomes of the argument as to the dangers of a short-circuit in view of these experiences ?

Returning to German records, we find that in 1907 when the Strausberg accident occurred—six years after the Government had commenced their electric lighting experiments—but a few trains were electrically lighted ; these included those running between Berlin and Altona, and some of the so-called "D" trains from the East of Germany, but, comparatively speaking, the amount of electric lighting on trains was small.

Commenting at the time on German inaction in the matter, we said in our issue of September 27th, 1907 : "The fact is that gas lighting has obtained such a powerful hold upon the German railways that very little hope exists, notwithstanding the fresh inquiries that are being made on the subject, of any definite proposals being made for the general introduction of the electric light throughout the passenger trains in Germany, unless a repetition of the horrors of Offenbach in the near future should unfortunately occur, and perhaps force the railway authorities to deal with the question seriously. In view of the excellent systems which have been developed in this country, there is no excuse for their inaction."

It is a somewhat ironical comment on the last sentence that we should now be deploring the effects of gas in the Aisgill catastrophe.

Up to the end of 1911 very little had been done in Germany beyond electrically lighting the sleeping cars of the State railways ; but, according to the *Frankfurter Zeitung*, it had then been decided that in future all passenger cars should be equipped with electric light on the Rosenberg system, a system in which each car is provided with a special dynamo driven from the axle, and an accumulator is also provided to give light when the train is at a standstill.

Turning to other Continental railways, and going back no further than the end of 1909, we find from our issue of January 7th, 1910, that during the Christmas holidays a shocking accident occurred at the small station of Uhersko between Pardubatz and Chotzan, to the express which starts at Prague. This express collided with a goods train at the station named above, when travelling at about 50 miles an hour. Immediately after the collision the escaping gas was ignited and set fire to the train, and it was not possible to rescue the imprisoned passengers until after the fire was extinguished. The roll of victims was 9 dead and 16 injured, many of the deaths being due to suffocation. We concluded our report of this accident in these words :—

"We trust that it will not require the sacrifice of a considerable number of British lives to induce our railway companies to adopt electric lighting." Yet since that date we have had to record collisions succeeded by fire at Hawes Junction, Saltley, Ditton Junction, and now Aisgill; surely we may now hope that the human sacrifice is complete, and that if the railway companies will not willingly do their obvious duty, means will be taken to force them to do so.

Following on the accident on the Canadian Pacific Railway early in 1910, when the fatalities directly due to the collision were augmented by the fire occasioned by the gas used for lighting the carriages, there was very considerable alarm felt in Austria in consequence of the Government's persistence in the use of gas. The liveliest dissatisfaction was expressed with the Ministry of Railways, and resolutions were moved in the State Railways Council in favour of the substitution of electricity for gas. According to the policy being pursued in 1910, it had been intended that the incandescent gas system should be in use on all the Austrian State railways by the year 1914, although it is interesting to note that the Royal Mail trains were then electrically lighted.

The public clamour, backed up by the Press, resulting in the resolutions in the Council referred to, was followed in July, 1910, by a request from the Council to the Ministry of Railways to discontinue the use of incandescent gas lighting, and to use electric light exclusively on all passenger cars, on order, or to be constructed in future.

The Government admitted that electric lighting presented economic advantages, and it was stated during the discussion that all the Swiss railways and the great French railways had decided to adopt electric light exclusively in the future.

The decision of the French authorities was no doubt influenced by a serious accident which occurred to a train at Villepreux in June, 1910, when following the accident the train was burnt, having been set on fire by the gas used for lighting.

Whilst it is clear from the foregoing that on some of the Continental State-owned railways the use of electricity for train lighting is increasing, and on others is now compulsory, the latter state of things has only been brought about by the pressure of public opinion, which has arisen out of the needless sacrifice of human life, due to the presence of gas on trains. Only by the strongest expression of public opinion, backed up by all the force of the daily and technical Press, shall we succeed in ousting gas from trains in this country.

We hope in our next article to deal with other aspects of the subject.

NOTES FROM CANADA.

[FROM OUR OWN CORRESPONDENT.]

THE Cedar Rapids Co. are building a plant of 100,000-H.P. capacity, which will later be increased to 160,000 H.P. The Rapids are near Montreal, on the St. Lawrence. The generating equipment has already been ordered, and comprises 12 10,800-H.P. units of 56 R.P.M., with a 30-ft. head.

At Bay Roberts, Newfoundland, the Western Union Telegraph Co. intends to erect an enlarged station of a permanent character to accommodate its trans-Atlantic cables.

Nearly 5,000 miles of telegraph wire will be erected by the C.P.R. between now and the end of this year.

In New Brunswick land is said to have been acquired by the Universal Radio Syndicate, for a wireless telegraph station intended for trans-Atlantic work.

The Montreal Transportation Co. has a vessel named the *Tynemount*, which was recently launched at Newcastle-on-Tyne, and which is of interest to electrical engineers, because in it is employed a combination of a Diesel engine and an electric motor for propulsion. It will be interesting to note whether other shipowners follow the example thus set.

An engineer has submitted plans to the Montreal Council for 12½ miles of double track underground tramway, the estimated cost of the scheme being £4,000,000.

The Medicine Hat Tramways Co., Ltd., proposes to build 11 miles of track, and until conditions warrant the building of a power house, the company will buy its power from the city at 1 cent per KW.-hour.

The Hydro-Electric Power Commission of Ontario is undertaking a great deal of new work at present, necessitated by the rapidly increasing demands for power. New transmission and distribution lines are being erected, new transforming stations built, and some of the old ones extended, the most important of the last class of work being the increasing of the capacity of the step-up station at Niagara Falls from 50,000 H.P. to 75,000 H.P.; a new hydro-electric power station is also being built to supply the Severn district, which is somewhat remote from the Niagara lines.

The rules and regulations recently issued by the Commission are now in force, and municipal inspection departments are being organised by the Commission's Chief Electrical Inspector throughout all Ontario, as these Rules govern work carried out in every part of the Province, and not merely where current is bought from the Commission.

Reference has been made two or three times previously to the excellent work done by the Commission of Conservation in looking after Canadian interests in the matter of water-powers to which this country and the U.S.A. have a joint claim. Capitalists from over the border get up great schemes for utilising large water-powers situated on the boundary line, but when the matter is thoroughly investigated, it usually appears (as is, perhaps, natural) that the lion's share is to go to the U.S.A.

The Commission of Conservation has just issued a report dealing with a proposal made by American capitalists to utilise the power of the Long Sault Falls, on the St. Lawrence River, situated about 75 miles above Montreal; the southern shore of the river is in New York State, and the northern shore in the Province of Ontario. The minimum available H.P. is 618,000, and the head 40 ft.

As in several former instances, the scheme is strongly opposed by the Commission, on the ground that it would be detrimental to Canadian interests.

The proposal of the Long Sault Development Co. involved the damming of the St. Lawrence, and the report in question points out that serious damage might result, apparently from ice jams which might form in an unexpected manner and give rise to unlooked-for difficulties.

The opinion is expressed that navigation would be interfered with; that, owing to the international character of the work, the Government might not have the right to expropriate; and that if it had such expropriation would cost an enormous sum of money.

The report states:—"Looking at the whole scheme, it does not appear that any serious attempt can be made to show that Canadian requirements or Canadian interests are an appreciable factor in the plans of the company. The plans contemplate the absolute monopolisation of the whole power available from the Rapids with a minimum of consideration of Canadian interests." The end of the report is worthy of notice too. "The obvious conclusion from the facts recited seems to be that the plain duty of Canada is to maintain her rights of ownership and jurisdiction absolutely unimpaired and untrammelled."

The Commission of Conservation cannot be too highly commended for the splendid work which it carries out even in guarding the interests of the country in matters of this kind, leaving out of consideration all the other objects of its care, such as forests, crops, the soil, &c.

Flying Race.—It has been decided to hold a flying race from Paris to London, cash prizes to the value of £700 and a trophy having been offered by the International Correspondence Schools; the Royal Aero Club of the United Kingdom and the Aero Club de France (which has offered a very substantial additional prize) are in charge of the arrangements, and it is likely that there will be at least 12 starters.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

CHILE.—In a recent issue of the ELECTRICAL REVIEW some information was given as to a proposed new tariff for goods imported into Chile, the effect of which would be to convert the present *ad valorem* tariff into a specific tariff (*i.e.*, certain specified rates on weight, number, &c., of the goods imported instead of rates on the value of the goods). The Board of Trade have now received information to the effect that a new valuation tariff has also been drawn up, and that unless the proposed new specific tariff is passed by the Government this year, the new valuation tariff will probably be put into force from January 1st, 1914. It is understood, however, that the projected valuation tariff now referred to is to be subjected to a further revision at the hands of the Commission, and that it is likely to undergo considerable modification before it is finally approved.

MEXICO.—A Mexican decree just passed states that for the future all import duties are to be paid by means of certificates issued by the Treasury. These certificates will be issued in four denominations—10 pesos, 50 pesos, 100 pesos and 5,000 pesos, and are to be sold for silver currency at their face value.

SALVADOR.—The following decisions as to Customs treatment of certain imported goods have recently been issued:—

Electric accumulators and Edison batteries for producing ignition in gasoline or petroleum motors	1 centavo per kg.
Rails weighing up to 35 lb. per yd. ...	Free

An additional duty of 2 centavos per 46 kg. is also to be levied on all goods, even those otherwise duty free, in order to provide funds for sanitary improvements at the various ports.

1 centavo = about ½d.

AUSTRALIAN COMMONWEALTH.—The Australian Customs authorities have issued the following decisions as to the duties under the preferential tariff applicable to British goods:—

Attractoscope, an electrical apparatus for projecting advertisements on footpaths ...	10 % ad val.
Electric locomotive for haulage purposes ...	20 % ad val.

NEW ZEALAND.—The Customs authorities have decided that Leskole distance thermometers, arc light projector lamps, and Minin violet-ray lamps for treatment of constitutional and skin diseases are to be admitted duty free.

CONGO STATE.—An Ordinance recently passed provides that importers are required to show on their entry forms the net weight of imported goods as well as the gross weight.

NICARAGUA.—The Board of Trade have received from the Consul at Managua a circular of the Nicaraguan Customs Department notifying that certificates of origin for goods the produce of countries (including the United Kingdom) which are entitled to the reduction of 25 per cent. of the Customs duties, must clearly describe the goods, indicating the marks and numbers of the packages, their contents, their gross weight, the number of the Consular invoice, and the name of the consignee.

The form in which certificates of origin must be drawn up may be inspected at the Commercial Intelligence Branch of the B. of T.

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

19,782. "Process and apparatus for electrically separating suspended bodies from electrically non-conducting, especially gaseous fluids." E. MOLLER. (Convention date, August 31st, 1912, Germany.) September 1st. (Complete.)

19,783. "Process and apparatus for electrically separating suspended bodies from non-conducting, especially gaseous, fluids." E. MOLLER. (Addition to 17,840/12.) September 1st. (Complete.)

19,752. "Impulse-producing mechanism." WESTERN ELECTRIC CO., LTD. (F. T. Woodward, United States.) September 1st.

19,753. "Casing for electric miners' lamps." P. PORSCKE, E. KLUNDER and G. KELLNER. September 1st.

19,754. "Air-tight casing for electric miners' lamps." P. PORSCKE, E. KLUNDER and G. KELLNER. September 1st.

19,782. "Solution for use in lead accummulator cells." P. RABBIDGE. (Convention date, September 2nd, 1912, Australia.) September 1st. (Complete.)

19,788. "Process for the preparation of absorbents to be used in the cells of electric dry batteries." P. RABBIDGE. (Convention date, September 27th, 1912, Australia.) September 1st. (Complete.)

19,803. "Heating water by electricity." H. TRENERRY and A. KINGMAN. September 2nd.

19,836. "Electrical musical instruments." D. W. BARTON. September 2nd. (Complete.)

19,838. "Machines for sealing supporting wires into the beads of the glass rods of metal-filament electric incandescent lamps." J. KREMENEZKY (firm of.) (Convention date, April 16th, 1913, Austria.) September 2nd. (Complete.)

19,840. "Process for manufacturing a heat and acid proof varnish." T. ROERIG. September 2nd.

19,846. "Electric switches." E. EBBE. September 2nd.

19,853. "Apparatus suitable for use in telegraphy and for other purposes." F. G. CREED and CREED, BILLE & Co., LTD. September 2nd.

19,854. "Galvanic batteries." J. E. PRESTON. September 2nd.

19,855. "Apparatus for projecting electro-magnetic rays to a distance," G. C. L. V. ULIVI. September 2nd.

19,857. "Electric anti-vibratory device." F. H. REEVES. September 2nd. (Complete.)

19,911. "Apparatus for wireless telephony." P. GEORGE WEBB and J. KRAMMER. September 3rd.

19,914. "Electrically operated winch specially applicable as an ash hoist," A. W. PRIM and F. W. ROPER. September 3rd. (Complete.)

19,916. "Electric lamp sockets." E. P. LE COMPTE and C. W. HODGSON. September 3rd. (Complete.)

19,919. "Electrical transformers." F. COATES, J. MIRREY and A. REYROLLE AND Co., LTD. September 3rd.

19,928. "Circuit arrangements for telephone systems." SIEMENS AND HALSKE AKT. GES. (Convention date, September 11th, 1912, Germany.) September 3rd. (Complete.)

19,938. "Electric incandescent lamps." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) September 3rd.

19,939. "Transmitter devices for copying and like telegraphic apparatus." A. RAPPENECKER. September 3rd. (Complete.)

19,945. "Electric lighting systems." H. E. SMITH. September 3rd.

19,965. "Electric contacts or switches, particularly those used in connection with electric motor horns." W. A. CROSBEE, F. S. C. CROSBEE and T. S. ROGERS. September 4th.

19,966. "Method and apparatus for the transmission of messages or designs such as photographs, clichés and the like." W. P. THOMPSON. (Soc. Anon. des Télégraphes Edouard Belin, France.) September 4th. (Complete.)

19,971. "Electric radiators." SIMPLEX CONDUITS, LTD., and L. M. WATERHOUSE. September 4th.

19,988. "Telephone systems." W. AITKEN. (Addition to 16,906/12, 14,524/13, 16,859/13, 18,349/13, and 19,521/13.) September 4th.

20,008. "Electrometers." B. SZILARD. (Convention date, October 15th, 1912, France.) September 4th. (Complete.)

20,011. "Telephone exchange system." M. L. JOHNSON. September 4th. (Complete.)

20,028. "Electric burglar alarms." A. RENCZEWITZ. September 4th. (Complete.)

20,056. "Electric incandescent lamps." A. H. DYKES and C. W. SMITH. September 5th.

20,064. "Electricity distributing systems." C. CUTHBERTSON. September 5th.

20,065. "Electrical switch cases." H. LUCAS and O. LUCAS. September 5th.

20,097. "Apparatus for projecting electromagnetic rays to a distance." G. C. L. V. ULIVI. September 5th.

20,112. "Saw for cutting mica and the like." E. A. SILK. September 5th.

20,123. "Manufacture of drawn wires from tungsten and the like metals." C. GLADITZ. September 5th.

20,135. "Electrical winches with continuously working motor." G. GARDE and DOEFORD, HAUSERG, MARSTRAND and HELWEG AKTIESELSKABET TITAN. September 5th. (Complete.)

20,127. "Electric light or other lamps." A. H. B. SHARPE. September 5th.

20,170. "Telephone transmission circuits." WESTERN ELECTRIC Co., LTD. (F. T. Woodward, Belgium.) September 6th. (Complete.)

20,191. "A combination of telephone apparatus and mechanical apparatus therewith for road and other services." J. F. WAKELIN and H. L. DENT. September 6th.

20,195. "Bonding clamp for metal-sheathed electric wires and cables." W. T. HENLEY'S TELEGRAPH WORKS Co., LTD., and W. F. BISHOP. September 6th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

METHOD OF INDIRECT EXCITATION FOR OSCILLATORY CIRCUITS. E. Girardeau. 11,708. May 16th. (May 17th, 1911.)

TROLLEYS OR COLLECTORS FOR ELECTRICITY. L. J. Tetlow. 16,549. July 15th.

COMBINED VOLTAGE REGULATORS AND SWITCHES FOR VARIABLE-SPEED GENERATORS. A. Pollak. 16,782. July 18th. (July 31st, 1911.)

ELECTRIC MOTOR CONTROL SYSTEMS. British Thomson-Houston Co. (General Electric Co.) 16,806. July 18th.

ELECTRIC CLOCK MOVEMENTS AND THE LIKE APPARATUS. C. H. Davies. 18,654. August 14th.

MEANS FOR CONVERTING ELECTRIC CURRENTS. A. R. Bullock. 19,000. August 19th.

ELECTRIC SNAP-SWITCHES. C. J. Klein. 19,073. August 20th.

APPARATUS FOR MEASURING THE ELECTRIC CONDUCTIVITY OF LIQUIDS. M. Coplans. 19,113. August 21st.

APPARATUS OR APPLIANCES FOR ELECTRICALLY OPERATING AND CONTROLLING VALVES. A. Bryan and L. F. Mountfort. 19,203. August 22nd.

SIGNALLING OR LIKE SYSTEMS. Automatic Telephone Manufacturing Co. (Automatic Electric Co.) 19,255. August 22nd.

ELECTRIC ARC LAMPS. N. H. Balfour and A. B. Hitchin. 19,264. August 22nd.

SELF-CONTAINED PORTABLE ELECTRIC LAMPS. S. Stern and British Ever-Ready Electrical Co. 19,318. August 23rd.

SWITCHES FOR ELECTRIC HAND LAMPS. S. Stern and British Ever-Ready Electrical Co. 19,451. August 24th.

PULSATION TIMING DEVICES FOR USE IN ELECTRICALLY-OPERATED VIBRATORY MUSICAL INSTRUMENTS. M. L. Severy and G. B. Sinclair. 19,870. August 30th.

HIGH-VOLTAGE CONTINUOUS-CURRENT DYNAMOS. C. W. Girvin. 22,270. October 1st.

ELECTRIC MOTOR CONTROL SYSTEMS. British Thomson-Houston Co. (General Electric Co.) 22,664. October 4th.

SPARKING PLUGS FOR INTERNAL-COMBUSTION ENGINES AND OTHER PURPOSES. A. J. Riley. 23,404. October 14th.

EVACUATED VITREOUS CONTAINERS HAVING SEALED-IN CONDUCTORS. British Thomson-Houston Co. (General Electric Co.) 23,775. October 17th.

X-RAY APPARATUS. H. C. Snook and E. W. Kelly. 24,046. October 21st. (October 27th, 1911.)

AUTOMATIC REGULATORS FOR DYNAMO-ELECTRIC MACHINES. British Thomson-Houston Co. and A. H. St. Croix Watson. 26,597. November 19th.

ELECTRIC ARC LAMPS. British Thomson-Houston Co. (General Electric Co.) 27,526. November 29th.

ELECTRIC SWITCHES. Siemens Bros. Dynamo Works, Ltd., and R. A. R. Bolton. 27,874. December 3rd.

ELECTRIC CONTACT DEVICES OF THE SWAN TYPE. R. Haddan. (Ludenscheider Metallwerke Akt.-Ges. vorm. Jule Fischer & Basse.) 29,372. (December 20th.)